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# University of Arizona Record

VOLUME 1, NUMBER 6-7

MAY 1909

## REGISTER

1908-09

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ANNOUNCEMENTS

1909-10

PUBLISHED BY THE  
UNIVERSITY OF ARIZONA  
TUCSON, ARIZONA



Tanque Verde Road

Base Ball Grounds

Science Building

Library

Parade Grounds

South Hall

Gymnasium

8

Main Building

Shop

Dining Hall

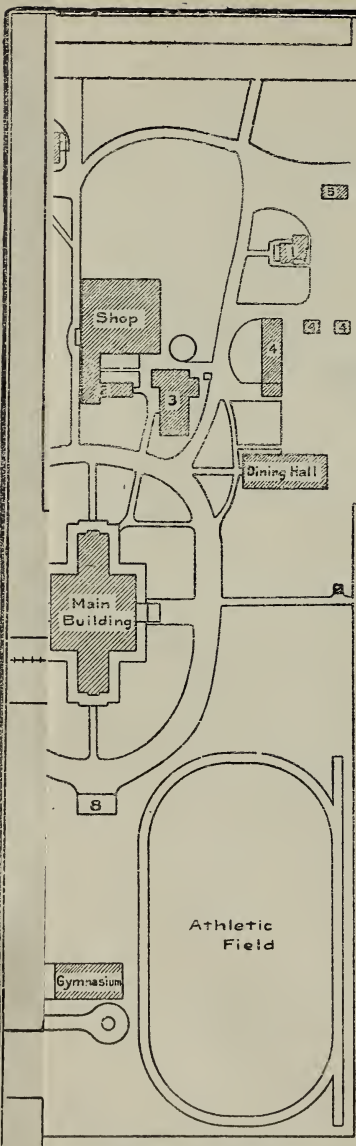
North Hall

- BUILDINGS.**
1. President's Residence
  2. Metallurgy
  3. Mechanical Engineering
  4. Green House
  5. Barns, etc.
  6. Shop and Corral
  7. Mill
  8. Weather Observatory

MAP OF THE  
CAMPUS  
UNIVERSITY  
OF  
ARIZONA  
TUCSON

Scale  
250 Feet to 1 Inch

Park Ave



BUILDINGS.

1. President's Residence  
Girl's Dormitory.  
Director's Residence
2. Metallurgy
3. Mechanical Engineering
4. Green House
5. Barns, etc.
6. Shop and Corral
7. Mill
8. Weather Observatory

MAP OF THE  
CAMPUS  
UNIVERSITY  
OF  
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TUCSON

Scale  
250 Feet to 1 Inch.

UNIVERSITY OF ARIZONA  
REGISTER

1908-9

WITH ANNOUNCEMENTS FOR

1909-10

TUCSON, ARIZONA  
F. E. A. KIMBALL, PRINTER  
1909

1909  
 1910  
 1911

1909  
 1910  
 1911

## CALENDAR.

### 1909.

- Sept. 16, Thursday.....Entrance Examinations  
 Sept. 17, Friday.....Condition Examinations  
 Sept. 20, Monday.....Registration Day.  
 Sept. 21, Tuesday.....First Semester begins.  
 Nov. 24, Wednesday.....Thanksgiving Recess begins  
 Nov. 29, Monday.....Instruction resumed.  
 Dec. 23, Thursday.....Holiday Recess begins.

### 1910.

- Jan. 3, Monday.....Instruction resumed.  
 Jan. 29, Saturday.....First Semester ends.  
 Jan. 31, Monday.....Second Semester begins  
 May 29, Sunday.....Baccalaureate Discourse.  
 May 31, Monday.....Exhibition Military Dept.  
 June 1, Wednesday.....Commencement.

**BOARD OF REGENTS.**

**Ex-Officio.**

HON. JOSEPH H. KIBBEY.....Phoenix  
*Governor of the Territory.*  
HON. KIRKE TONNER MOORE LL. B.....Phoenix  
*Superintendent of Public Instruction.*

**Appointed by the Governor.**

Term expires.

HON. MERRILL P. FREEMAN, Tucson.....August, 1909  
*Chancellor.*  
HON. GEORGE J. ROSKRUGE, Tucson.....August, 1909  
*Secretary.*  
HON. CHARLES H. BAYLESS, A. M., Tucson, August, 1909  
*Treasurer.*  
HON. A. V. GROSSETTA, Tucson.....August, 1911

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Regular meetings on the 10th of each month.

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Withdraw

308457  
133933

# OFFICERS OF INSTRUCTION, INVESTIGATION AND ADMINISTRATION.

## FACULTY.

KENDRIC CHARLES BABCOCK, Ph. D.

B. L., 1889, Minnesota; A. M., 1895, Harvard; Ph. D., 1896, Harvard.

President; Professor of History and Economics. 1903 \*

WILLIAM PHIPPS BLAKE, A. M.

Ph. B., 1852, Yale; A. M., Dartmouth; D. Sc., 1907, Pennsylvania;  
LL. D., 1908, Arizona.

Professor of Geology, Emeritus. 1895.

ROBERT HUMPHREY FORBES, M. S.

B. S., 1892, M. S., 1895, Illinois.

Director and Chemist, Agricultural Experiment Station.  
1894.

†FRANK NELSON GUILD, M. S.

B. S., 1894, M. S., 1903, Vermont.

Professor of Chemistry and Mineralogy. 1897.

GEORGE EDSON PHILIP SMITH, C. E.

B. S., 1897, C. E., 1899, Vermont.

Irrigation Engineer, Agricultural Experiment Station. 1900

JOHN JAMES THORNBURGH, A. M.

B. S., South Dakota (Agricultural); B. S., 1897, A. M., 1901, Nebraska.

Professor of Biology; Botanist, Agricultural Experiment  
Station. 1901.

‡SAMUEL VICTOR MCCLURE.

First Lieutenant, U. S. A., 1896, West Point.

Professor of Military Science and Tactics. 1904.

EDWIN MORTIMER BLAKE, Ph. D.

Engineer of Mines, 1890; Ph. D., 1893, Columbia.

Professor of Mathematics and Mechanical Engineering  
1904.

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\*Dates following titles indicate appointment to service in the University.

†Leave of absence, 1908-9.

‡Resigned, November, 1908.

CYRUS FISHER TOLMAN, Jr., B. S.

B. S., 1896, Chicago.

Professor of Geology and Mining Engineering. 1905.

WILLIAM WHEELER HENLEY, A. B.

A. B., 1905, Leland Stanford, Jr.

Professor of Mechanic Arts. 1905.

ANDREW ELICOTT DOUGLASS, Sc. D.

A. B., 1889; Sc. D., 1908, Trinity.

Professor of Physics and Astronomy. 1906.

ALBERT EARLE VINSON, Ph. D.

B. S., 1901, Ohio (State); Ph. D., 1905, Goettingen.

Biochemist, Agricultural Experiment Station. 1905.

CHARLES ALFRED TURRELL, A. M.

B. S., 1896, Nebraska; A. M., 1901, Missouri.

Professor of Modern Languages. 1904.

LESLIE ABRAM WATERBURY, C. E.

B. S., 1902, C. E., 1905, Illinois.

Professor of Civil Engineering. 1907.

ROBERT RHEA GOODRICH, M. S.

B. S., (Mining), 1885; B. S., (Mechanical Eng.), 1901; M. S., 1902, Massachusetts  
Institute of Technology.

Professor of Metallurgy. 1907.

ROBERT WAITMAN CLOTHIER, M. S.

B. S., 1897; M. S., 1899, Kansas (Agricultural).

Professor of Agriculture and Conductor of Farmers' Institutes. 1907.

J. ELIOT COIT, Ph. D.

B. S., North Carolina; M. S. 1905; Ph. D., 1907, Cornell.

Horticulturist, Agricultural Experiment Station. 1907.

ERNEST SUTHERLAND BATES, Ph. D.

A. B., 1902, A. M., 1903, Michigan; Ph. D., 1908, Columbia.  
Professor of English. 1908.

HIRAM McL. POWELL.

Captain, U. S. A., 1890, West Point.  
Professor of Military Science and Tactics, 1909.

WILLIAM BURNETT McCALLUM, Ph. D.

B. S. A., 1894, Toronto; Ph. D., 1904, Chicago.  
Associate Botanist, Agricultural Experiment Station. 1907.

FREDERICK W. WILSON, B. S.

B. S., 1905, Kansas (Agricultural).  
Associate Animal Husbandman, Agricultural Experiment  
Station. 1905.

WILLIAM GEORGE MEDCRAFT, A. M.

A. B., 1898, A. M., 1904, Kansas Wesleyan.  
Assistant Professor of Mathematics. 1905.

RAYMOND C. BENNER, M. S.

B. S., 1902, Minnesota; M. S., 1905, Wisconsin.  
Assistant Professor of Chemistry. 1906.

HENRY ALFRED ERNEST CHANDLER, B. S.

B. S., 1905, Northwestern.  
Assistant Professor of History and Economics. 1908.

WILLIAM HORACE ROSS, Ph D

B. S., 1903; M. S., 1904, Dalhousie; Ph. D., 1907, Chicago.  
Assistant Chemist, Agricultural Experiment Station. 1907.

FRANK CALEB KELTON, B. S.

B. S., 1904, Arizona.  
Assistant Engineer, Agricultural Experiment Station, 1909.

MARION CUMMINGS STANLEY, B. L.

B. L., 1900, California.

Instructor in Philosophy. 1902.

ESTELLE LUTRELL, A. B.

A. B., 1896, Chicago.

Instructor in English; Librarian. 1904.

FREDERICK EDWIN TALMAGE, B. L.

B. L., 1903, California.

Instructor in Stenography and Bookkeeping. 1904

LEVONA PAYNE NEWSOM, Ph. D.

A. B., 1892, Ph. D., 1895, Franklin.

Instructor in Latin. 1905.

\*OPAL IONE TILLMAN, B. S.

B. S., 1905; M. S. 1906, Ohio State.

Instructor in Domestic Science and Botany. 1906

IDA CHRISTINA REID, Ph. B.

Ph. B., 1906, Arizona.

Instructor in History and Mathematics. 1906.

CAROLINE BATES SINGLETON, A. B.

A. B., 1906, Wellesley.

Instructor in English. 1908.

ETHELBERT WEBB WALDRON, A. B.

A. B., 1905, Michigan.

Instructor in English. 1908.

WILLIAM ARTHUR TARR, B. S. (Mining).

B. S. (Mechanical Eng.), 1904, Oklahoma; B. S. (Mining), 1908, Arizona.

Instructor in Geology and Mining. 1908.

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\*Resigned March 9, 1909.

HELEN JANE ALDRICH, A. M.

A. B., 1904, Minnesota; A. M., 1905, Colorado.

Instructor in Modern Languages. 1908.

FRANK LEWIS KLEEBERGER, B. S.

B. S., 1908, California.

Instructor in Physical Training and Director of the Gymnasium. 1908.

ELIZABETH ELLINWOOD ROBERTS, A. B.

A. B., 1906, Western Reserve.

Instructor in German. 1908.

MABEL A. GUILD.

Instructor in Latin. 1908.

\*MRS. W. J. KIRKPATRICK.

Instructor in Music. 1909.

---

DANIEL TREMBLY MAC DOUGAL, Ph. D.

(Director of the Department of Botanical Research of the Carnegie Institution of Washington.)

Honorary Lecturer on Heredity and Evolution.

## ADMINISTRATIVE OFFICERS AND ASSISTANTS.

---

FREDERICK EDWIN TALMAGE, B. L.

Secretary of the University; Head of North Hall. 1904.

HERBERT BROWN.

Curator of the Territorial Museum.

LURENA MERRIMAN.

Preceptress of Young Women. 1907

ARTHUR W. OLCOTT, M. D.

Medical Examiner for Men. 1905.

FRANK LEWIS KLEEGER.

Head of South Hall. 1907.

WILBUR OLIVER HAYES.

Secretary of the Agricultural Experiment Station.

MILES M. CARPENTER, B. S.

Clerk in President's Office. 1907.

WALTER M. COLE.

Superintendent of Buildings and Grounds. 1907

MISS MABEL A. GUILD.

Assistant Librarian. 1908.

MISS B. S. CLAYPOOL.

Assistant in the Library. 1909.

LAWRENCE A. CALLOWAY.

Assistant in Chemistry. 1908.

FLETCHER M. DOAN.

Assistant in Metallurgy.

WILLIAM R. HARRIMAN.

Assistant in Physics.

ERNEST O. BLADES.

Assistant in Mechanic Arts.

## **STANDING COMMITTEES.**

**1908-1909.**

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The President is ex-officio member of all committees.

### **Executive.**

Professors Forbes, Tolman, E. M. Blake.

### **Registration and Classification.**

Professors E. M. Blake, Waterbury, Medcraft, Chandler

### **Library.**

Professors Tolman, Turrell, Miss Lutrell.

### **Public Exercises.**

Professor Medcraft, Miss Lutrell

### **Co-operative Association.**

Mr. Talmage.

### **Rhodes Scholarship.**

President Babcock, Professors Guild, Bates

# UNIVERSITY OF ARIZONA

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**Established by Act of the Legislative Assembly, 1885,  
Open to Students, October, 1891.**

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## PURPOSE AND ORGANIZATION.

The University of Arizona is an integral part of the system of public education established by and for the Territory, and aims, as the head of such system, to fill the same position as that occupied by the State Universities in such states as California and Wisconsin. Its general organization is in accordance with the Act of Congress of July 2, 1862, known as the Morrill Act, creating the "Land Grant Colleges." The details of its organization and government are regulated by the Act of the Legislative Assembly of the Territory of Arizona, passed in 1885 and embodied, with amendments in the Revised Statutes of Arizona Territory, 1901, which vests the government of the institution in a corporation styled the Board of Regents of the University of Arizona, consisting of the Governor and Superintendent of Public Instruction of the Territory, ex-officio, and four other members appointed by the Governor for a term of four years.

In creating the University, the Legislative Assembly wisely followed the example of the great states of Wisconsin, Illinois, Minnesota, Nebraska, and California, in unifying under one management the various schools and institutions of higher learning or investigation in Arizona,—the colleges of liberal arts, the schools of

mining and engineering, the agricultural college, and the agricultural experiment station, which in some States have been widely and completely separated. No professional schools of law, medicine, dentistry, or music have been established. In compliance with the provisions of the Act creating it, the University consists of

- I. The College of Agriculture and Mechanical Arts.
- II. The School of Mines.
- III. The Agricultural Experiment Station.
- IV. The Preparatory Department.

The Normal Department, authorized by the statute, has not yet been organized. The Preparatory Department, which is really a first class manual training high school with a four years course, will gradually disappear as the educational system of the Territory is developed by the establishment of efficient high schools, but no date is set for abolishing even the first year of this preparatory course.

The University in all departments is open to properly qualified persons of both sexes. Through the aid received from the United States and from the Territory, it is enabled to offer its privileges to residents and non-residents, with only very moderate charges. The number of students in any one class or section of a class is kept below twenty, in order that each student may receive the individual attention of the instructors and thus gain the full advantage derivable from a small school.

The purpose of the University of Arizona is, in the language of the organic law, "to provide the inhabi-

tants of this Territory with the means of acquiring a thorough knowledge of the various branches of literature, science and the arts," and so far as possible a technical education adapted to the development of the peculiar resources of Arizona. In furtherance of this latter purpose, instruction is provided especially in subjects fundamental to agriculture, the mechanic arts, mining and metallurgy. The University, by the nature of its situation, frankly lays its strongest emphasis upon the course in mining engineering. It is, in reality, a great mining laboratory, surrounded as it is on all sides by great mines. Some of these mines developed on a large scale are within a few miles of the city and the number and magnitude of such enterprises are steadily increasing. Probably no University in the United States offers such fine advantages to the students of mining engineering who desire to see the actual operation of great mines, or the development of great enterprises, while carrying on the theoretical and experimental work of the mining course.

The advantages in civil engineering are hardly less noteworthy, for Tucson is not only a division point on the main line of the Southern Pacific railroad, with large shops, roundhouses, and engineering offices, but it has the administrative and engineering headquarters for five of the subsidiary or allied lines of the Southern Pacific system in Arizona and in Sonora, Mexico, commonly known as the Randolph lines, including the great West Coast Line which will reach from Guaymas to Mazatlan and Guadalajara, in Mexico. All of these lines

are undergoing extensive expansion and rebuilding, and so furnish excellent opportunities for observation and vacation employment for students of civil engineering.

### LOCATION AND CLIMATE

The University of Arizona is located at Tucson, a city of eighteen thousand inhabitants, on the main line of the Southern Pacific railway, 312 miles west of El Paso, Texas, and 500 miles east of Los Angeles, Cal. The city lies in a broad flat valley at an elevation of 2,400 feet above sea level and is surrounded by mountains. Its dry, mild, and equable climate has made Tucson a famous winter resort unsurpassed for healthfulness.

The winter climate is especially good; the temperature is cool and strengthening but not severe, the lowest temperature recorded during the average year being about twenty degrees above zero, Fahrenheit. Little rain falls during the winter; fogs are all but unknown; cloudy days are rare. The percentage of sunshine throughout the winter is greater than that recorded at any other place in the United States. Owing to the extreme dryness of the air the highest temperatures known are less oppressive to the senses and less dangerous to the health than the summer heats of the upper Mississippi Valley States. The total amount of rainfall averages less than twelve inches

These advantages insure to students a comfortable education and a wide range of out-door sports and recreations throughout the college year.

The University Campus, consisting of fifty-five acres, is situated upon high ground about a mile from the business center of the city with which it is connected by an excellent electric street-car line. On every side it commands a view of mountain scenery of remarkable extent and grandeur. The buildings are lighted by electricity furnished by the city plant.

An abundant supply of unusually good water for household, laboratory and irrigation purposes is drawn from a large well on the Campus from a depth of one hundred and twenty feet, thus securing immunity from the dangers of a contaminated water supply. The Campus has a complete sewer system connecting all the buildings, with one exception, with the city mains at the University gate.

The Campus, carefully laid out in drives, lawns and gardens, with a large number of palms, olive, ash, umbrella, pepper, bagota and cottonwood trees has the air of a well kept park.

#### BUILDINGS.

The main building, University Hall, the oldest of the group, is 200 x 150 feet, two stories in height, the first of gray stone, the second of red brick. It is completely surrounded by a wide two-story veranda. The building contains recitation rooms, laboratories and apparatus rooms of various departments, an assembly room, and the office, laboratories and library of the Agricultural Experiment Station.

The library and museum building is a handsome structure of red brick and Bedford sandstone, with a

massive tile roof. The interior finish is in natural oak and pine. The library reading room, on the second floor, is a large, well-lighted room, beautifully furnished with heavy solid oak reading tables, desks and wall cases. The stack room at the rear is fitted up with the most modern steel stacks. The Museum occupies part of the first floor and the west half of the second floor. Fine oak and plate glass cases constitute the furnishings. The offices of the president and secretary of the University, three lecture rooms for the departments of geology, mathematics, English and history, work rooms for the library and museum, and a laboratory for the department of geology are on the first floor.

Science Hall, a new building, of architecture harmonious with the Library, which it faces, was completed in April of this year, within the appropriation of \$40,000 made by the Territorial Legislature of 1907. Another appropriation of \$12,000 was made in March for furnishing and equipping the building, which will thus be ready for occupancy in September. The building, 145 x 60 feet, is of three stories, the first to be devoted to physics, the second to chemistry and mineralogy, and the third to botany and biology. The roomy attic and a superstructure on the roof are used as an astronomical observatory. The forty rooms provided by this Science Hall will give excellent accommodations in place of the crowded quarters endured by several departments in recent years in University Hall, and the removal of these departments to the new building will give the Agricultural Experiment Station much needed space for its expanding work.

North Hall, a dormitory two stories in height, built of gray stone of fine quality, is occupied by the college men. Besides the parlor, and rooms of the instructor in charge, it contains seventeen rooms, each large enough to accommodate two students, besides bath and toilet rooms.

South Hall, a large brick building containing forty rooms, besides bath and toilet rooms and store rooms, is the dormitory mainly for preparatory students. It is heated by a hot-water system. It will accommodate seventy-five students.

West Cottage, with its new four-room annex, is the dormitory for young women,—a two story brick house with wide porches, surrounded with vines, shrubbery, lawns and trees.

The Dining Hall, built of red brick, provides ample boarding accommodations for all persons living on the Campus.

The Shop and Assay Building is a large, substantial brick structure. It contains a commodious drawing room for mechanical and free-hand drawing, a large laboratory for forge work, machine practice and carpentry, and a lecture room, instrument room, and material-testing laboratory for the department of civil engineering. Two other rooms are used for lockers, and for the motor and engine. The assay laboratory and commercial assaying department occupy five rooms fully equipped with a large melting furnace, the necessary muffle furnaces, and other accessories for making complete and accurate assays.

The Mill or Mining Machinery building, located to the northeast of the main group of buildings, is a plain wooden structure in which are placed the stamp-mills, jigs, concentrating tables, separators, etc., necessary for the mining laboratory.

Herring Hall, the gymnasium, is a very substantial high building, 40 x 80 feet, constructed of red brick and white plaster. It was erected in 1903, the gift of Professor James Douglas and his associates of the Copper Queen Consolidated Mining Company, through Colonel William Herring, after whom it was named, at the suggestion of Professor Douglas.

The pump house and mechanical engineering laboratory was built in 1905. By the use of brick, cement and iron it is practically fire proof, thus insuring safety to the well and pumps supplying the University with water for all its uses .

Two two-story brick residences are occupied by the President of the University and by the Director of the Agricultural Experiment Station.

Other buildings are the cottage occupied by the Superintendent of Buildings and Grounds, three green-houses, a brick barn, and various smaller out-buildings used for shops and store rooms.

#### MAINTENANCE.

The University is maintained by funds appropriated by the United States and by the Territory of Arizona. Fifty-seven sections of very valuable pine land in Cocino County have been set apart by the Federal Government for the benefit of the University, but title and con-

trol of the land does not pass to the Board of Regents until the Territory is admitted as a State. In the meantime only a very small sum is annually received from the leases of this land.

By the provisions of the Morrill Act of 1890, the University receives annually from the United States the sum of \$25,000 "to be applied only to instruction in agriculture, the mechanic arts, the English language and the various branches of mathematical, physical, natural and economic science, with special reference to their applications in the industries of life, and to the facilities for such instruction." This Morrill Fund is to be ultimately duplicated by the Nelson Fund, created by the Act of March 4, 1907, which appropriated \$5,000 for the year beginning July 1, 1907, and provided for an annual increase of \$5,000 until the total received by each State should be \$50,000 per year from the two funds. The University receives from the same source, for the support of the Agricultural Experiment Station, \$15,000 yearly from the Hatch Act of 1887; the Adams Act of 1906, for the current year, appropriates \$11,000 which is to be increased annually by \$2,000 until it also produces \$15,000, giving the Station ultimately \$30,000 per year.

The appropriations by the Territorial Legislative Assembly of 1909 were \$35,500 per year, for two years, for maintenance; \$13,100 for the work of the Agricultural Experiment Station, and \$23,000 for improvements.

For the year 1909 the El Paso & Southwestern system has given the University \$2,000 for the work of

the Agricultural Experiment Station in carrying on experiments in dry-farming in Cochise County.

The University also receives annually, from miscellaneous sources such as matriculation and tuition fees, rent of cottages, damage to University property, etc., about \$1,500. The receipts for board, lights, etc., amount to about \$16,000 per year.

#### ENDOWMENT.

By the munificence of Doctor James Douglas, of New York, the University received in June, 1908, "the sum of \$10,000 \* \* \* the annual interest or income from which is to be annually applied, devoted, expended and used by said Board of Regents, or its successors in trust, for the purchase of instruments of precision and research, or special apparatus, for scientific instruction and education in the department of mineralogy and School of Mines of the University of Arizona, \* \* \* but no part of said fund or income is to be used or applied to the purchase of mining or metallurgical machinery or supplies for said department or for the use of the students in the chemical or metallurgical laboratories." The fund thus created has been named by the Board the Douglas Endowment Fund.

The Philo Sherman Bennett Scholarship is endowed by the gift of \$500 to the University in 1905, through the agency of Mrs. William Jennings Bryan, the income to be used in aiding young women to secure an education.

## EQUIPMENT.

## LIBRARY.

The library contains 14,000 bound volumes and 12,000 pamphlets, and is open for the use of all students. Of these volumes a collection of complete sets of scientific and literary periodicals, to which additions are made yearly, is of special service in reference work. The library was made a regular depository of United States Government documents in 1907.

The books are classed by the decimal system and shelved in numerical order with a further author division according to the Cutter numbers. The catalogue is the usual dictionary card catalogue of authors, subjects and titles in one alphabetical arrangement. Library of Congress cards are used whenever obtainable. The Reading Room is supplied with about 600 books of general reference which may be consulted by the students without any formality. The following current periodicals and newspapers are on file for the use of students and general readers in the Reading Room:

## PERIODICAL LIST.

|                               |                                |
|-------------------------------|--------------------------------|
| *Advocate of Peace,           | American Institute of Mining   |
| American Architect and Build- | Engineers, Transactions,       |
| ing News,                     | American Journal of Phar-      |
| American Blacksmith,          | macy,                          |
| American Chemical Journal,    | American Journal of Science,   |
| American Chemical Society,    | American Journal of Sociology, |
| Journal,                      | American Machinist,            |
| *American Economist,          | American Magazine,             |
| American Historical Review,   |                                |

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\*Donated.

|                                                                      |                                             |
|----------------------------------------------------------------------|---------------------------------------------|
| American Mathematical Society, Bulletin,                             | Chemical News,                              |
| American Mathematical Society, Transactions,                         | Chemical Society, Journal, (London),        |
| American Naturalist,                                                 | Chemisches Centralblatt,                    |
| *American Philosophical Society, Proceedings,                        | Coal and Coke,                              |
| American Society for Testing Materials, Proceedings,                 | Collier's Weekly,                           |
| American Society of Civil Engineers, Transactions,                   | Conservation,                               |
| Arena,                                                               | Craftsman,                                  |
| Annales des Mines,                                                   | Cumulative Book Index,                      |
| *Arizona Mining Review,                                              | Current Literature,                         |
| Association of Engineering Societies, Journal,                       | Delineator,                                 |
| Astrophysical Journal,                                               | Deutsche Chemische Gesellschaft, Berichte,  |
| Athenaeum,                                                           | Dial,                                       |
| Atlantic Monthly,                                                    | Economic Geology.                           |
| Australian Mining Standard,                                          | *Educational Gazette,                       |
| Biedermann's Zentralblatt fur Agrikulturchemie,                      | Educational Review,                         |
| *Bookbuyer,                                                          | Electrical Review,                          |
| Bookman,                                                             | Electrical World,                           |
| Botanical Gazette,                                                   | Electrochemical and Metallurgical Industry, |
| Botanisches Centralblatt,                                            | Engineering and Mining Journal,             |
| *California Cultivator,                                              | Engineering Index,                          |
| Canadian Entomologist,                                               | Engineering Magazine,                       |
| Canadian Mining Journal,                                             | Engineering News,                           |
| *Canal Record,                                                       | Engineering Record,                         |
| Cassier's Magazine,                                                  | Espana Moderna, La.,                        |
| Cement,                                                              | *Farmer's Voice,                            |
| Century,                                                             | Fern Bulletin,                              |
| Chemical, Metallurgical and Mining Society of South Africa, Journal, | Forum,                                      |
|                                                                      | Franklin Institute, Journal,                |
|                                                                      | Geological Magazine,                        |
|                                                                      | Geological Society of America, Bulletin,    |
|                                                                      | Geologisches Centralblatt,                  |

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\*Donated.

- Good Housekeeping,  
 Graphic (London),  
 Harper's Monthly Magazine,  
 Harper's Weekly,  
 Havana University, Revista de  
 la Facultad de letras y  
 ciencias.  
 Institut de France, Paris,  
 Academie des Sciences,  
 Comptes rendus des Seances.  
 International Studio,  
 Irrigation Age,  
 Journal of American Folk-lore,  
 Journal of Geography,  
 Journal of Geology,  
 Journal of Political Economy,  
 Ladies' Home Journal,  
 Literarisches Zentralblatt,  
 Literary Digest,  
 Living Age,  
 \*Lowell Observatory, Bulletin,  
 McClure's Magazine,  
 Manual Training Magazine,  
 Mexican Mining Journal,  
 Mineral Industry,  
 Mines and Minerals,  
 Mining and Scientific Press,  
 \*Mining Reporter,  
 \*Mining Review,  
 Mining Science,  
 \*Mining World,  
 Modern Language Association  
 of America, Publications,  
 Nation,  
 New Zealand Mines Record,  
 Nineteenth Century and After,  
 North American Review,  
 \*Our Dumb Animals,  
 Out West,  
 Outing,  
 Outlook,  
 Plant World,  
 Poet-lore,  
 Political Science Quarterly,  
 Popular Astronomy,  
 Popular Science Monthly,  
 Power,  
 Practical Engineer,  
 \*Prairie Farmer,  
 Public Libraries,  
 Publishers' Weekly,  
 Quarterly Journal of Eco-  
 nomics,  
 Queensland Government Min-  
 ing Journal,  
 Reader's Guide to Periodical  
 Literature,  
 Review of Reviews,  
 Revue des deux Mondes,  
 School Review,  
 School of Mines Quarterly,  
 Science,  
 Scientific American,  
 Scientific American, Supple-  
 ment.  
 Scribner's Magazine,  
 Societe Francaise de Mineral-  
 ogie, Bulletin,  
 Society of Chemical Industry,  
 Journal,  
 South African Mining Journal,  
 World's Work.

Torrey Botanical Club, Bulletin,  
Zeitschrift fur Anorganische

Chemie,  
Zeitschrift fur Physikalische Chemie.

NEWSPAPERS ON FILE IN THE READING ROOM.

\*Arizona Blade,  
\*Arizona Bulletin,  
Arizona Daily Star,  
\*Arizona Gazette,  
Arizona Range News,  
\*Arizona Silver Belt,  
Arizona Weekly Journal  
Miner,  
Bisbee Review,  
Coconino Sun,  
Los Angeles Times,  
\*Graham County Guardian,

Mojave County Miner,  
New York Evening Post  
(Saturday).  
\*Oasis,  
Prescott Weekly Courier,  
Southwestern Stockman,  
\*Tempe News,  
Tucson Citizen,  
Tucson Post,  
Tombstone Epitaph,  
Weekly Republican.

The Carnegie Library of the City of Tucson is also open to the use of the students of the University. This library is also a depository of United States Government documents.

MUSEUM.

The Seventeenth Legislative Assembly of Arizona established a general museum at the University, to promote the collection of materials of all kinds illustrating the resources and development of Arizona, and particularly to preserve historical relics, including those pertaining to the aboriginal inhabitants. Donations of specimens and collections will be received and acknowledged with thanks, but no special provision has yet been made by the legislature for the support of this department, aside from a small appropriation for the salary of a curator.

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\*Donated.

The professors of the University have the immediate care of the collections pertaining to their respective departments. The collections now displayed at the University comprize representative series of minerals, ores and rocks of Arizona. Among these may be particularly mentioned superb specimens from the mines of the Copper Queen Mining Company at Bisbee. There are also collections of typical rocks and minerals for comparison, and many specimens of ores from different parts of the United States and from abroad. It is desired to make the collection of ores and minerals fully represent the great mineral resources of Arizona.

The Museum is indebted to Mr. Herbert Brown, curator, for a large and valuable collection of skins of the birds of Arizona, which he has deposited in the Museum, as well as for a collection of ancient aboriginal pottery and other relics. The fossil skull and teeth of an elephant, and other fragmentary remains of extinct animals, sent from Yuma by Mr. Brown, deserve special mention.

Historical records of much value are gradually accumulating as a part of this museum, and an appeal is made to old settlers and others to bear this fact in mind when making disposition of articles bearing even remote relation to the early pioneers and their history. All records and data of any nature that can be gleaned are worthy of preservation, and it is earnestly desired to have them placed at the University, where they will always be accessible for reference.

## AGRICULTURE AND HORTICULTURE.

For purposes of instruction and demonstration by the department of agriculture, as distinguished from the Agricultural Experiment Station, the University has purchased a tract of eighty acres of rich alluvial land in the Rillito valley just north of the Campus, which will take the place of the twenty-three acres leased during the past year in the Santa Cruz valley. On this tract new construction will be undertaken during the coming summer with a view to a rapid and permanent development of a varied instructional plant to meet the needs peculiar to this part of the great Southwest. In addition to the regular laboratories in physics, chemistry, etc., a special laboratory for soil physics will be fitted up in University Hall for use in the coming year. An excellent seed collection, green houses and tracts for experimentation, and a well selected agricultural library are other valuable parts of the equipment of the department. Funds have already been set aside for the purchase of live stock for the work in animal husbandry.

In addition to regular courses of instruction in agriculture and horticulture, "Timely Hints for Farmers," issued under the auspices of the Experiment Station, are of distinct educational value. Three thousand farmers of the Territory are reached more or less regularly by timely publications on subjects of vital interest. Farmers' Institutes, announcements of which are made from time to time, are supplemented by short courses in agriculture.

Small and well selected agricultural libraries of small cost have been forwarded to a considerable number who have expressed a willingness to receive them.

#### BIOLOGY.

The biological laboratories are at present located on the second floor of University Hall. They are soon to be moved into Science Hall, to a fine suite of rooms, convenient and well-lighted; the equipment is such as is required for modern instruction and research in the biological sciences. The library and apparatus are well selected and adapted to the region and the courses offered.

The collections possessed by the department form a very important part of its equipment. The herbarium consists of 12,000 sheets of mounted plants, of which number 2,500 are included in the University botanical survey herbarium. The unique flora and fauna of the mountain, mesa and lowland collecting grounds, in close proximity to the institution, offer very attractive opportunities for instruction and research especially along ecological lines. The Desert Botanical Laboratory of the Carnegie Institution supplements in most admirable fashion the facilities of the University for investigation.

In addition to the above there are fifty cases of insects, a large case of seeds, articulate and disarticulate human skeletons, plaster and papier mache models of

the important structures of the human anatomy, and duplicate material for study and dissection.

#### CHEMISTRY.

The chemical laboratories used for instruction have for many years been located in University Hall, but at the beginning of the next academic year they will occupy the extensive suite of twelve laboratories, class rooms, storerooms, etc. on the second and third floors of the new Science Hall.

That used by beginners in the study of general chemistry and qualitative analysis is on the second floor of University Hall, and is equipped for the experimental and theoretical study of chemical science.

The laboratory for qualitative analysis is on the first floor of University Hall. It is thoroughly equipped for the teaching of volumetric and gasometric analysis, blow-pipe analysis, metallurgical chemistry, and wet and fire assaying, including apparatus for the electrolytic determination of metals.

The balance room contains analytical and bullion balances of the latest model so arranged as to insure a maximum of stability and accuracy. A lecture and demonstration room fitted with sinks, cabinets, etc., completes an equipment of apparatus and collections adequate for first class instruction in both theoretical and practical chemistry.

The laboratories of the Agricultural Experiment Station occupy three rooms on the first floor. These

are devoted to analytical work and chemical investigations relating to agriculture. Though not intended for the use of students they are of incidental value to the instructors and students through the investigations which are here conducted.

#### CIVIL ENGINEERING.

The apparatus in this department has been chosen with the view of familiarizing the student with the instruments which are used in practical civil engineering work and in the allied branches of hydraulic and mining engineering. The equipment includes surveyors' and engineers' levels; plane table; stadia, level, and transit rods; aneroid barometers; odometer; automatic water registers; hook gauges; current meters; drafting instruments; mechanical calculators; planimeter; a complete set of apparatus for testing cement; and an Olsen Universal testing machine of 100,000 pounds capacity.

#### GYMNASIUM.

Herring Hall, the gymnasium, is fully equipped for the purposes of the department of physical training and athletics. The apparatus is of standard make, and includes forty chestweights, dumb-bells, bar-bells, wands, Indian clubs, Medart vaulting horse, parallel bars, horizontal bar, quarter-circle, abdominal chair, wrestling machine, finger machine, chest expander, chest developer, climbing rope, flying rings, traveling rings, striking bag and drum, jump and vaulting stands, fencing foils and masks, basket balls and goals, five large mats and a set of anthropometric apparatus.

In the basement are located ninety-six lockers, and five shower baths which are supplied with hot water from a heater with large reservoir.

The outdoor equipment consists of two baseball fields; a football field, six-lap track, and straightaway, at the rear of the gymnasium; four fine tennis courts; and a basketball court for girls.

#### MATHEMATICS.

Models are an important aid to the study of mathematics. The collection of the department includes thread models of about forty ruled surfaces of the third, fourth and sixth orders. These illustrate the theory of surfaces and are also valuable in the study of kinematics and linkages.

The Bulletin and Transactions of the American Mathematical Society, and the Encyklopedia der Mathematischen Wissenschaften are subscribed for by the University Library.

#### MECHANIC ARTS.

The Shops and Drawing rooms occupy a total floor area of about 8,000 square feet, divided into a large shop, and machinery room, with adjacent tool rooms, supply rooms and store rooms, a draughting room, model room, pattern room, lecture room, and offices.

The entire building is well ventilated and lighted, from above as well as from the sides. The drafting room is heated by steam.

The wood shop is equipped with a full assortment of hand tools, six turning lathes, a Universal woodworking

machine, a Whitney dimension sawing machine, a band saw, a Universal trimmer and a large grindstone with truing device.

The forge room contains twenty-four down-draught forges, twenty-four anvils, a combination shear and punch, a blacksmith's drill press and a full assortment of small tools and appliances. Blast is furnished by a No. 3 Sturtevant blower; the smoke and gases are removed by a 70-inch exhaust fan.

The machine shop contains one 24-inch Lodge and Shipley engine lathe with taper attachment, two 14-inch Lodge and Shipley lathes, one 14-inch Pratt and Whitney lathe with taper attachment, one 10-inch Reed speed lathe, one 16-inch Cincinnati shaper, one 24-inch by 6-foot Woodward and Powel planer, one Brown and Sharpe No. 2 Universal milling machine, one Brown and Sharpe No. 1 Universal grinder, one 24-inch Prentice Bros. drill press, one power hack saw, one drill grinder, one emery stand and one grinding attachment for the lathes. A 1 1-2 ton portable crane and a 1-ton triplex chain hoist are used in handling the heavier work.

Each shop has its own tool room well arranged and supplied with small tools, gauges, measuring instruments, etc.

A large wash room containing a hundred lockers, is supplied with basins and running water.

#### MECHANICAL ENGINEERING.

This department has a drafting and recitation room in the Library Building in addition to the regular draw-

ing rooms of the department of Mechanic Arts. In this room is the catalogue file containing the trade literature of about five hundred leading manufacturers of the United States; the collection of working drawings consisting of over three hundred blue prints, and the sample collection of models, machine parts, valves, electrical fittings, insulating materials, abrasives, etc.

The mechanical and electrical laboratory, which occupies a large room adjoining the Pump House, is equipped for the study and operation of boilers, steam and gasoline engines, hydraulic and electrical machinery. Besides the machinery of the shop and mill which can be used for experimental purposes and for study of machine design, the University has a 45 h. p. tubular boiler, 35 h. p. Atlas engine, 30 h. p. Scott engine, a 10x7x10 Worthington Duplex pump, a Duplex feed pump, a Cameron pump, a 3 h. p. and a 1-2 h. p. direct current electric motor, an injector, a 500-gallon fire pump, a 40 h. p. Fairbanks-Morse gasoline engine, a 23 k. w. direct current Crocker-Wheeler generator, electrical measuring instruments, and a steam gauge tester. A 300-gallon two-stage centrifugal pump in the University well and its electric motor serve as part of the equipment for mechanical engineering.

#### METALLURGY.

The Mill, or metallurgical laboratory, is equipped for use by the students of metallurgy in connection with their work in testing ores as to their adaptability for

treatment by different processes both on a large and a small scale.

The chief features of the equipment are: a Blake crusher, 4 in. by 7 in.; a Dodge crusher, 4 in. by 6 in.; sampling rolls, 6 in. by 9 in.; a cone and burr sample grinder; a pebble mill with a capacity of about 15 lbs. at one charge; a laboratory lightning crusher and a disc pulverizer; a 5-stamp mill, with 800-pound stamps; a 3-stamp mill, with 250-pound stamps; inside and outside amalgamated plates for the same; a 2-ft. clean-up pan; a 1-ft. amalgamation pan, and a 9-jar revolving agitator for testing samples of a few ounces; a No. 5 Wilfley table of the latest pattern, and a Hallett hand jig; a 1 1-2 ton cyanide plant for treating sands or dry crushed ore; two 150-lb. cyanide plants for treating smaller samples; 3-ft. agitator; a 12-in., 6-chamber, flush plate and frame, washing filter press and pump for the same; a Sturtevant shaking screen; a Tullock ore feeder, a belt and bucket elevator, sampling plates, split samplers, a shaking screen, percolators, sizing screens from 1-mesh to 200-mesh, miner's pans, bateas, retorts, etc.

The power for operating this plant is furnished by a 30 h. p. Westinghouse induction motor, type C.

The assay laboratory is equipped with assay furnaces for crucible work, for scorifying and cupeling, and for retorting mercury from amalgam, besides all needed appliances for assaying by dry and wet method including electrolysis. The laboratory also has desks and fittings for the chemical work required in the met-

allurgical and mineralogical investigation and analysis of ores, in mineral fertilizers, and in qualitative tests of minerals.

#### MILITARY.

Room O, in University Hall, is used as an armory. It is fitted up with the necessary gun racks and accessories. The equipment includes 150 old style Springfield rifles, 100 Krag cadet rifles with complete accoutrements, eight sabers and belts, musical instruments for the band, and signal flags. A large clear area south of the Library building is kept leveled and smooth for a drill ground and parade ground. At the rear of the Mill building are the targets for short range practice.

Fifteen 10 x 12 army wall tents with poles, etc., and a mess outfit, constitute the camp equipment of the department of military science and tactics for use on practice marches and annual encampments.

#### MINERALOGY AND PETROGRAPHY.

The laboratory for qualitative analysis is used for determinative mineralogy and blow-pipe analysis. The laboratory is supplied with necessary apparatus for student work, including glass and wooden models for the study of crystallography, hand and reflecting goniometers for the measurement of the angles of crystals, a polariscope for the study of the optical properties of minerals, and a type set of 600 minerals.

For the study of petrography the laboratory is supplied with a type set of rocks classified according to Rosenbusch's *Elemente der Gesteinlehre* with thin sec-

tions corresponding, four petrographic microscopes, a collection of oriented sections of minerals and apparatus for studying interference phenomena.

In anticipation of occupying the fine quarters in the new Science Hall, Prof. Guild, who is absent on leave in Europe during this year, has been authorized to spend \$1,000 for further equipment for the department of mineralogy.

#### PHYSICS AND ASTRONOMY.

The department of physics and astronomy, hitherto located in University Hall, will occupy in September, 1909, the entire first floor of the new Science Hall, where the facilities for the demonstration of all important phenomena will be very complete. A lecture room seating forty persons will be fitted with every modern convenience, such as lights, water, gas, heliostat, alternating and direct currents of great range, an opaque projection lantern, a double dissolving arc-light Ideal stereopticon, elevated seats, shutters for darkening the room, etc. Two large main laboratory rooms supply space for mechanical and electrical work, while separate special rooms are devoted to heat, sound, light, magnetism and research work. A carpenter's shop, a repair and store room, a photographic dark and enlarging room and a constant temperature room are provided. A pendulum seismograph will be installed in the magnetic laboratory and a special space has been provided for a 55-foot Foucault pendulum and the study of falling bodies.

An eight-inch Willyoung induction coil with storage and X-ray accessories is used in the study of high-tension electricity. Through the generosity of the Honorable Mark J. Egan, of Clifton, the University added to its equipment for the study of electricity a fine imported set of miniature wireless telegraphy apparatus, capable of transmitting messages about two hundred feet. The department is also equipped with three motor generator sets, the largest having an output of 7 kilowatts, with a Leeds and Northrup potentiometer and accessories, and with very complete apparatus for showing electro-magnetic phenomena, rotary fields, stationary electric waves, etc.

The astronomical observatory is at the top of the building where a sliding roof, 12 feet square, uncovers the telescope and discloses a clear horizon in every direction. An 8-inch Clark lens and mounting, both of the first quality, loaned to the University by the Observatory of Harvard University, Cambridge, Mass., are mounted on a cement pier supported on the main walls of the building, and give perfectly steady images. This lens is most efficient in fundamental research work.

The equipment also includes a four and one-quarter inch Brashear telescope, sidereal and mean time clocks and pier for latitude and longitude observation.

## **GENERAL INFORMATION.**

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### **COLLEGE OF AGRICULTURE AND MECHANIC ARTS.**

The courses offered in the College of Agriculture and the Mechanic Arts provide both a liberal training along literary and scientific lines and technical training along engineering, mechanical and agricultural lines. Great latitude of election is given in the literary and scientific courses, but the courses in engineering are more rigid in their requirements. Full details of the various courses follow. The aim in all is to combine the practical with the theoretical instruction. The needs of a young and growing commonwealth are kept in mind, and a steady attempt is made to develop the adaptability and resourcefulness so necessary to meet changing conditions.

### **ARIZONA SCHOOL OF MINES.**

The School of Mines is designed for the education and training of young men in the arts and sciences directly involved in the industries of mining and metallurgy. Especial attention is given to the sciences of mathematics, physics, chemistry, mineralogy, geology and their applications. The Bureau of Mines and Assaying, while not directly connected with the work of instruction, affords with its laboratory and the influx of new material, a valuable object lesson to the advanced students of mining and metallurgy.

### **REGISTRATION.**

All students are expected to register on registration day at the beginning of the year and at the beginning

of the second semester, in the University office or in such rooms as may be designated on that day. Before making choice of elective subjects the student should in every case confer with the instructors concerned and with the committee on registration. A matriculation fee of \$5.00 is required of all students upon entering the University. No student will be considered registered until the matriculation fee has been paid. This fee is paid once and is not required for future registration. After registration no change in classes can be made without the consent of the committee on registration.

Students entering from other institutions should present to the committee certified copies of their records in such schools, together with certificates of graduation or of honorable dismissal. A copy of the school catalogue or course of study should be furnished with the credentials, in order to facilitate the work of the committee.

#### TUITION.

Tuition is free to students of Arizona. For all non-resident students, tuition is \$10 for each semester. No reduction will be made for late registration or early withdrawal.

#### RECORDS.

The class standing of each student is determined by the instructor in charge. The method of ascertaining the student's record is left to the instructor, and his report in all cases is final.

### DISCIPLINE.

The disciplinary policy of the University in all its departments is based upon the assumption that the students are young gentlemen and young ladies who come to the institution with a high determination to utilize fully the opportunities offered, and with a keen sense of duty, honor and courtesy to each other and to the faculty. Formal and explicit prohibitions and rules are few, but those will be rigidly enforced, with adequate penalties, and good order and discipline will be maintained. The University is a civil rather than a military community, and such privileges as will not be abused will be allowed all classes of students. In aggravated cases, such as cheating in University work, frequenting saloons and other objectionable places, and serious breaches of peace or order, the faculty will not hesitate to proceed to the extreme measure of expulsion. In case of expulsion the student is required by regulation of the regents and faculty to leave the campus immediately, and by Territorial statute to surrender his cadet uniform to the University. In all matters of discipline the faculty and President will strive for fairness, equity and efficacy rather than uniformity.

Students or classes desiring to make requests of the faculty should file their petition in the President's office before the hour of faculty meeting; class petitions must be presented at least two days before the time of meeting.

### VACATIONS AND HOLIDAYS

A short recess (see Calendar, page 2) is taken at Christmas time. The long summer vacation begins about June first and continues until the middle of September. The Thanksgiving recess extends from the close of the regular exercise on the Wednesday before Thanksgiving to the next Monday morning. During the spring, the cadet companies make a practice march of from three to seven days, which constitutes in reality a third vacation for the preparatory department and for freshmen. All legal holidays are observed by the cessation of ordinary University work.

Arbor day has been formally adopted by the University regents as the regular anniversary on which to celebrate the founding of the institution, in connection with the ceremonies of tree planting.

### LIVING ACCOMODATIONS.

Provision is made so far as possible for furnishing board and rooms to students of both sexes upon the University grounds. Young men have comfortable quarters in South Hall, which can accommodate about seventy-five students, two in a room, and in North Hall (for College men only), which can accommodate thirty-five students. West Cottage, the home of the young ladies, is in charge of an experienced and capable preceptress who has constant supervision of those rooming there. *No students known to have tuberculosis will be admitted to the dormitories or dining hall.*

All dormitories are lighted by electricity; South Hall is heated by a hot water system, the other dormitories being heated by stoves. Rooms contain a clothes press, and are provided with single bedsteads, table, chairs, mirror, wash-bowl, pitcher and slop-jar. Students will supply their own mattresses, pillows, sheets, blankets, towels, rugs and brooms, and such other articles as they may desire for ornamenting their rooms. They will care for their own rooms under the direction of the head of each dormitory.

The Dining Hall of the University has accommodations for one hundred students. It is under the management of a paid steward who is responsible to the president and the Board of Regents. While the charge for board is very low, it is the aim of the management to serve substantial, wholesome, appetizing meals. All students having rooms in the dormitories are required to take their meals at the Dining Hall. Students and members of the faculty who reside outside the dormitories, may board at the Dining Hall.

By resolution of the Board of Regents of the University, board is to be paid in advance on the twelfth of each month. If tickets for the Dining Hall are not purchased before the twelfth of each month, \$18.00 instead of \$17.00 will be charged for the month's board. Checks and postoffice or express money orders should be made payable to the President. No reduction in the bill for board will be made for a period less than one week, except by special arrangement at the office.

## FEES AND EXPENSES.

Lowest. Highest.

|                                                                     |         |         |
|---------------------------------------------------------------------|---------|---------|
| Tuition, free to students from Arizona . . . . .                    |         |         |
| Tuition, students non-residents of Arizona, each semester . . . . . | \$10.00 | \$10.00 |
| Maintenance fee (deposit) by students in men's dormitory . . . . .  | 3.00    | 3.00    |
| Mining excursions for advanced students . . . . .                   | 20.00   | 40.00   |
| Military uniform, cadet grey . . . . .                              | 16.25   | 24.00   |
| Military uniform, khaki . . . . .                                   | 7.25    | 10.00   |
| Books, per annum . . . . .                                          | 5.00    | 20.00   |
| Board, per month . . . . .                                          | 17.00   | 20.00   |
| Lights per room, per month . . . . .                                | .50     | 1.50    |
| Napkins . . . . .                                                   | .50     | .50     |

## LABORATORY FEES.

Assaying. See Metallurgy 2.

|                                                 |         |
|-------------------------------------------------|---------|
| Botany 1, 2, 3, 4, each . . . . .               | \$ 2.50 |
| Chemistry 1, 2, 3, 4, 5, 6, each . . . . .      | 12.00   |
| Chemistry III, (Preparatory, year) . . . . .    | 12.00   |
| Civil Engineering 1, 2, (year) . . . . .        | 3.00    |
| Mechanic Arts I, II, 1, 2 (each year) . . . . . | 5.00    |
| Metallurgy 2 (Assaying) . . . . .               | 25.00   |
| Mineralogy 1, 2, (year) . . . . .               | 15.00   |
| Mineralogy 3, 4, (year) . . . . .               | 5.00    |
| Physics 1, 2 (year) . . . . .                   | 2.00    |
| Physics IV (year) . . . . .                     | 3.00    |

Text-books may be obtained directly from the publishers through a book association managed on the co-operative plan under the direction of the faculty.

Members of the cadet companies will be required to provide themselves with the prescribed uniform, which will be ordered by the University. The cost of the cadet grey, woolen uniform, which must be deposited in advance, averages about \$16.25. The uniform has shown better wearing qualities than a civilian suit of equal cost, and parents are urged to consider the matter of uniform when supplying their sons with clothing for the approaching University year. It may be worn on all occasions, and thus will remove the necessity for additional expenditure for outer clothing other than overcoats. When the warm weather of spring comes, the students are expected to purchase the regulation khaki uniform and campaign hat, the total expense being about \$7.25.

#### ASSISTANCE TO STUDENTS.

The University has at present no loan funds with which to aid students who must earn their way. Various positions about the grounds, buildings and laboratories of the University, paying from \$4 to \$20 per month, are filled by students who must be self-supporting. The number, however, is not large, and preference is given to students from Arizona and to those who have spent time enough in the University to demonstrate that they are earnest, capable, reliable young men, likely to do this outside work and at the same time maintain a good record as students. During the current academic year forty-two different students have

thus received assistance, totaling \$2700, or an average of \$64.

The Philo Sherman Bennett scholarship was constituted by the gift of \$500 to the University in 1905, through the agency of Mrs. William Jennings Bryan, to be used in aiding young women to secure an education. The income will be awarded to a deserving applicant in the year 1908-9.

#### REQUIREMENTS FOR ADMISSION.

Applicants for admission to any department of the University will be required to furnish satisfactory evidence of good moral character, and certificate of graduation or of honorable dismissal from the schools with which they were last connected.

For admission to the Freshman class, applicants must be at least sixteen years of age and must satisfy requirements in subjects sufficient to give sixteen credits as described below. A credit is understood to be the equivalent of one study pursued satisfactorily at least four times a week for one year. as ordinarily taught in high schools.

Students coming from approved high schools and preparatory schools, and presenting a detailed official statement of work completed from the principals of such schools, will be excused by the committee on registration from entrance examinations in those subjects covered by the credentials, with the exception of English composition. Other students will be required to pass the entrance examinations.

For admission to the course leading to the degree of Bachelor of Philosophy, the subjects and credits assigned each are:

|                         |   |                       |   |
|-------------------------|---|-----------------------|---|
| English.....            | 4 | Latin.....            | 3 |
| Algebra and Plane       |   | Greek, French, German |   |
| Geometry.....           | 2 | or Spanish.....       | 2 |
| History and Civics..... | 2 | Elective.....         | 2 |
| Science.....            | 2 |                       |   |

For admission to the course leading to the degree of Bachelor of Science, including the degrees of Bachelor of Science in Mining Engineering, Civil Engineering, Mechanical Engineering, of Metallurgy, the subjects and credits assigned each are:

|                        |   |                           |   |
|------------------------|---|---------------------------|---|
| English.....           | 4 | French, German or Spanish | 2 |
| Mathematics.....       | 4 | Physics and Chemistry...  | 2 |
| History and Civics.... | 2 | Elective ...              | 2 |

#### SCOPE OF THE ADMISSION REQUIRMENTS.

##### ENGLISH.

ENGLISH—4 credits. (a) English classics. An acquaintance with the works named below. These works are divided into two classes, those intended for thorough study and those intended for general reading. The portion of the examination devoted to the former class will be upon subject matter, form and structure. In addition, the candidate may be required to answer questions involving the essentials of English grammar, and the leading facts in those periods of English literary history to which the prescribed books belong. In the portion of the examination devoted to the latter class, the candidate will be required to present evidence of a general knowledge of

the subject matter, and to answer simple questions on the lives of the authors. The form of the examination will usually be the writing of a paragraph or two on each of several topics, to be chosen by the candidate from a considerable number—perhaps ten or fifteen—set before him in the examination paper. The treatment of these topics is designed to test the candidate's power of clear and accurate expression, and will call for only a general knowledge of the substance of the books. In preparation for this part of the requirement, it is important that the candidate shall have been instructed in the principles of writing English. A knowledge of grammar is presupposed. (b) English Composition. The examination will take the form of a theme of five hundred words on some subject familiar to the candidate and will be a practical test of his ability to express himself in writing clearly and consecutively. No candidate will be accepted whose work is notably defective in point of neatness, spelling, punctuation, idiom, or division into paragraphs. Those found lacking in composition will be required to make good the deficiency at once in a special class organized for that purpose.

No student will be admitted without examination, except on the certificate from his former instructors that the entire requirement has been fulfilled. Substantial equivalents, properly certified, will be accepted.

For thorough study, for 1910: Shakespeare's *Macbeth*, Milton's *Lycidas*, *Comus*, *L'Allegro* and *Il Penseroso*; Burke's *Speech on Conciliation with America* or

Washington's *Farewell Address* and Webster's *First Bunker Hill Oration*; Macaulay's *Life of Johnson* or Carlyle's *Essay on Burns*.

For general reading and practice, selections will be made, at the discretion of the teacher from groups I-VI of College Entrance Requirements in English for 1910-11.

#### MATHEMATICS.

ALGEBRA—1 1-2 or 2 credits. The work required in algebra covers the usual fundamental subjects, and extends through quadratic equations, radicals, and proportion, as given in Wells' *Essentials of Algebra*, or Wentworth's *High School Algebra*.

PLANE GEOMETRY—1 credit. A year devoted to the subject as treated in the textbooks of Wells or Wentworth, emphasizing original exercises.

SOLID GEOMETRY—1-2 credit. A half year should be given to this subject, emphasizing the geometry of the sphere and the original exercises.

TRIGONOMETRY—1-2 credit. Both plane and spherical trigonometry are required. The student should be familiar with the use of logarithmic and trigonometric tables.

#### HISTORY.

To meet the requirement in history the student will be expected to have used a good textbook, to have done regular reference work, and to have kept a notebook with outlines, summaries, maps, and topical notes on readings, varying in proportion, according to the advancement of the course.

ANCIENT HISTORY—to the year 800 A. D. 1 credit.

MEDIAEVAL AND MODERN HISTORY OF EUROPE—  
1 credit.

HISTORY OF ENGLAND—1 credit.

HISTORY AND GOVERNMENT OF THE UNITED STATES  
—1 credit.

#### LANGUAGE.

\*GREEK—2 credits. As covered by Gleason and Atherton's *Beginners' Greek Book*; Xenophon's *Anabasis*, four books; Homer's *Iliad*, three books, with composition and use the of Hadley and Allen's or Goodwin's *Greek Grammar*.

\*LATIN—2, 3 or 4 credits. As covered by Collar's *First Latin Book* and *Viri Romae*, together with Allen and Greenough's *Grammar* and texts; sight reading; Cæsar, four books, or an equivalent; Cicero, four orations; Virgil, six books; sight reading from Nepos, Cicero and Gellius; Daniell's or Bennett's *Prose Composition*.

\*GERMAN—2 credits. As covered by Bacon's *German Grammar*, with readings outlined for German 1, 2, 3, 4, or an equivalent.

\*SPANISH—2 credits. As covered by Hills and Ford's *Spanish Grammar* with readings, etc., outlined for Spanish 1, 2, 3, 4, or an equivalent.

\*FRENCH—2 credits. As covered by Fraser and Squair's *French Grammar* (Parts I and II) with

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\*If any language is offered it must be to the extent of two credits, since a single year's study of a language is not considered of sufficient educational value to be entitled to credits.

readings, etc., outlined for French 1, 2, 3, 4, or an equivalent.

#### SCIENCE.

PHYSICAL GEOGRAPHY—1 credit or 1-2 credit. A year or half year of work which should include the principles of the subject, as treated in the best recent text-books, field and laboratory study, and the interpretation and steady use of topographic and weather maps, charts, etc. This subject may be combined in half-credits with botany, zoology, or physiology, which may in their turn be offered as full credits if it is so desired.

BOTANY—1 credit or 1-2 credit. The course should cover a study of the life histories of types from the main groups of plants, and a series of simple physiological experiments. At least two-thirds of the course should consist of laboratory work. .

CHEMISTRY—1 credit. A year's course of descriptive chemistry, consisting of both class-room and laboratory work, which should include the more common metals and non-metals and their compounds. A careful record of laboratory experiments should be kept.

PHYSICS—1 credit. Along with the use of one of the standard text-books the year's course should include continuous and systematic laboratory practice, which should be recorded in a notebook.

#### ELECTIVES.

The electives offered for admission should be chosen from any other subjects ordinarily taught in high schools and accepted by reputable colleges and universities.

### ADMISSION TO ADVANCED STANDING.

Students coming from other institutions of recognized standing may be admitted to classes above Freshman upon the presentation of properly authenticated certificates of work done, and when so admitted will be credited upon the records of this University with so much of such work as corresponds approximately with the courses required for the desired degree here. Certificates of record should be accompanied by statements of honorable dismissal or leave of absence, and a copy of the register or catalogue showing the content of the credits certified.

### ADMISSION FROM ARIZONA NORMAL SCHOOLS.

By arrangements with the Arizona Normal School at Tempe, and the Northern Normal School at Flagstaff, students from these institutions will be received into the University without examination, and given credit for all work which is the equivalent of courses offered by the University either for admission or for a degree. Students from this University may also obtain the equivalent privilege at the Normal Schools by presenting the proper certificate of standing, signed by the president.

### ADMISSION UPON CERTIFICATE.

Since the statutes of Arizona provide that the course of study in the high schools of the Territory "shall be such as, when completed, shall prepare its students for admission into the Territorial University," the Univer-

sity admits without examination, save in English composition, graduates of approved high schools of Arizona. Diplomas or corresponding credentials from high schools and preparatory schools in other states, accredited by the universities of such states, will excuse from examinations in the subjects covered by such credentials, save in English composition.

Accredited four-years high schools in Arizona:

|          |           |
|----------|-----------|
| Bisbee,  | Mesa,     |
| Clifton, | Phoenix,  |
| Douglas, | Prescott. |

High schools with approved courses not yet in full operation:

|        |            |
|--------|------------|
| Globe, | Tombstone, |
| Tempe, | Tucson.    |

## COURSE OF STUDY AND DEGREES.

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All facilities and privileges of the University are open to qualified persons of both sexes.

The University offers four-years courses of study leading to the degrees of Bachelor of Philosophy and Bachelor of Science, and to those degrees specialized as shown on pages 54-56. In each course the work is partly required and partly elective, as described by schedules later. Each student doing full work is required to take not less than fifteen hours of class room work per week. In laboratory work a period from two to three hours is considered the equivalent of one recitation or lecture hour.

Persons of mature age and with sufficient preparation, who are not candidates for degrees, may be admitted to regular classes as special students, provided, however, that in all such cases they show to the satisfaction of the instructors in charge that they can take the course with profit to themselves and without detriment to the regular class. It is expected that those who desire thus to specialize in mineralogy, assaying, geology or surveying, will have had at least a high school education, or its equivalent, particularly in English, algebra, geometry, physics and chemistry.

The faculty reserves the right to omit classes in any course of instruction unless a suitable number of students register for the course.

Students who complete satisfactorily the required work, and the specified amount of elective work, as shown in the accompanying schedules, will be given the degree of Bachelor of Philosophy or Bachelor of Science. The special character of any course of study is indicated by adding to the degree the name of the department, as: Bachelor of Science in Mining Engineering, of Bachelor of Science in Metallurgy.

Military science and tactics and physical training are required during the freshman and sophomore years for all male students, and physical training for female students. If for any reason a student is excused from these exercises, an additional subject having a minimum of three recitation hours per week will be required.

Credit towards degrees is given by means of a unit system which assigns to each course of instruction offered a certain number of units of credit. A unit ordinarily represents one class-room hour per week, or its equivalent of two or three laboratory hours, for one semester. One hundred and thirty-one units, including three units in military science and tactics and physical culture, are required for obtaining a degree in any of the courses.

Any candidate for a degree may present as part fulfillment of requirements for graduation an acceptable thesis embodying the result of a special study of some subject within the range of the course pursued. The subject of the thesis must be submitted for the approval of the faculty at the opening of the senior year, and the

completed thesis must be presented not later than three weeks before Commencement day. The credit value will be determined by the faculty at the time the subject is approved.

### GROUPS OF SUBJECTS.

#### General:

English, Philosophy, Mathematics, Military Science,  
Physical Training.

#### Group A:

Latin, Greek, French, German, Spanish.

#### Group B:

Economics, History, Law, Sociology.

#### Group C:

Agriculture, Astronomy, Botany, Chemistry, Geology, Mineralogy, Physics, Zoology.

#### Group D:

Civil Engineering, Mechanic Arts, Mechanical Engineering, Metallurgy, Mining Engineering.

### REQUIREMENTS FOR DEGREES.

The units necessary for the different degrees are set forth in the following tabulations:

|                                 | Required | Free elective. |
|---------------------------------|----------|----------------|
| <b>Bachelor of Philosophy:</b>  |          | 29             |
| English.....                    | 24       |                |
| Philosophy.....                 | 12       |                |
| Mil. Science, Physical Training | 3        |                |
| Group A.....                    | 32       |                |
| Group B.....                    | 15       |                |
| Group C.....                    | 16       |                |
| Total, 131 units.               |          |                |

**Bachelor of Science:**

Required    Elective

44

|                                 |    |
|---------------------------------|----|
| English.....                    | 8  |
| Mathematics.....                | 16 |
| Mil. Science, Physical Training | 3  |
| Group B.....                    | 4  |
| Group C and Group D.....        | 56 |

Total, 131 units.

**CIVIL ENGINEERING.**

(See Mining Engineering, p. 56, for First and Second Years.)

| III YEAR.                | UNITS | IV YEAR.              | UNITS. |
|--------------------------|-------|-----------------------|--------|
| Math. 5, 6.....          | 9     | Civ. Eng. 3, 6.....   | 5      |
| Astron. 2.....           | 3     | Civ. Eng. 7, 8.....   | 8      |
| Mineral. 1.....          | 4     | Civ. Eng. 13, 15..... | 6      |
| Physics 4.....           | 4     | Mech. Eng. 1, 2.....  | 6      |
| Civ. Eng. 9, 11, 14..... | 12    | Elective.....         | 5      |
|                          | 32    |                       | 30     |

**METALLURGY.**

(See Mining Engineering, p. 56, for First and Second Years)

| III YEAR.          | UNITS | IV YEAR.                         | UNITS |
|--------------------|-------|----------------------------------|-------|
| Math. 5, 6.....    | 9     | Metal. 1, 3, 4, 5, 7, 9, 10..... | 13    |
| Mineral. 1, 2..... | 7     | Min. Eng. 1, 2.....              | 4     |
| Geol. 1, 2.....    | 8     | Civ. Eng. 14.....                | 4     |
| Chem. 5, 6.....    | 8     | Geol. 3.....                     | 3     |
|                    | 32    | Mech. Eng. 1, 2.....             | 6     |
|                    |       |                                  | 30    |

## MINING ENGINEERING.

| I YEAR.             | UNITS            | II YEAR.            | UNITS         | III YEAR.            | UNITS | IV YEAR.                  | UNITS |
|---------------------|------------------|---------------------|---------------|----------------------|-------|---------------------------|-------|
| English 1, 2.....   | 6                | Math. 3, 4.....     | 6             | Math. 5, 6.....      | 9     | Min. Eng. 1, 2, 3, 4, 7.. | 8     |
| Math. 1, 2.....     | 10               | Phys. 1, 2.....     | 8             | Mineralogy 1, 2....  | 7     | Geol. 3, 4.....           | 6     |
| Chem. 1, 2.....     | 8                | Chem. 3, 4.....     | 6             | Geology 1, 2.....    | 8     | Geol. 5, 6, and Mineral.  |       |
| Mech. A. 1, 2.....  | 4                | Met. 2.....         | 2             | Met. 3, 5A, or 7, 5B | 4     | 3, 4 or Mech. Eng. 1, 2,  |       |
| Mech. A. 3, 4.....  | 4                | Mech. A. 5, 6.....  | 4             | Civ. Eng. 14, or     |       | 3, 4, or Civ. Eng. 6, 7,  |       |
| Mil. Sci.....       | 1                | Civ. Eng. 1, 2..... | 8             | Geol. 7 and Chem. 10 | 4     | 11, .....                 | 12    |
| Phys. Training..... | $\frac{1}{2}$    | Mil. Sci.....       | 1             |                      |       | Elective.....             | 4     |
|                     | 33 $\frac{1}{2}$ | Phys. Training..... | $\frac{1}{2}$ |                      |       |                           | 30    |

## MECHANICAL ENGINEERING.

|                     |                  |                     |   |                       |    |
|---------------------|------------------|---------------------|---|-----------------------|----|
| Math. 3, 4.....     | 6                | Math. 5, 6.....     | 9 | Mech. Eng. 5, 5 ..... | 6  |
| Phys. 1, 2.....     | 8                | Mech. Eng. 1, 2, .. | 6 | Mech. Eng. 7, 8.....  | 4  |
| Mech. A. 5, 6.....  | 4                | Civ. Eng. 5, 6..... | 8 | Mech. Eng. 9, 10..... | 6  |
| Mech. Eng. 3, 4.... | 6                | Phys. 3, 4.....     | 7 | Civ. Eng. 14.....     | 4  |
| Civ. Eng. 1, 2..... | 8                | Mech. A. 7, 8.....  | 4 | Elective.....         | 10 |
| Mil. Sci.....       | 1                |                     |   |                       | 30 |
| Phys. Training..... | $\frac{1}{2}$    |                     |   |                       |    |
|                     | 33 $\frac{1}{2}$ |                     |   |                       |    |

(See Mining Engineering for First year)

## ADVANCED DEGREES.

Advanced degrees will be given only for work done in residence. 30 units of such work will be required for the degrees of Master of Arts, Master of Science, and Engineer of Mines, together with a thesis. The courses in each case will be laid out by those in charge of the departments in which the work for the degree is to be taken, and must be approved by a committee composed of all the heads of departments.

Students who expect to make mining engineering their profession are advised to take a fifth year, or a five-years course, since the four-years course gives insufficient time for a student to master all the subjects that are essential for the practice of mining engineering, with its requirements of a knowledge of following, mining, and handling ore, of the working out of the geology of an ore body and the fault systems which affect it, and of the principles and practices of ore reduction. Six months of work underground and in smelters, with a satisfactory detailed report on the same, will be required. This work may be done during summer vacations.

## **COURSES OF INSTRUCTION.**

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Courses having odd numbers are given in the first semester; those having even numbers, in the second semester. The hours mentioned show the number of periods per week. The subjects are arranged alphabetically.

### **\*AGRICULTURE.**

PROFESSOR CLOTHIER AND MR. \_\_\_\_\_

#### **1. Plant Culture and Orchard Management.**

PROFESSOR CLOTHIER.

Elementary plant physiology, taking up the process of seed germination; the function of roots, stems, leaves, buds, flowers; the plant as affected by unfavorable environment. Plant propagation. Selection of orchard site; lifting, packing, shipping and transplanting trees and vines; cultivation, pruning, spraying, picking, packing and marketing fruits. Open also to preparatory students.

5 hrs., first semester. 4 units.

#### **2. Home and Market Gardening. PROFESSOR CLOTHIER.**

Practical and theoretical training in the general principles underlying successful intensive farming and the adaptability of Arizona for this branch of farming.

3 hrs., second semester. 2 units.

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\*These Courses in Agriculture are also open to students in the Short Course in Agriculture.

**3, 4. Breeds of Farm Animals.** Mr. \_\_\_\_\_

The history of the origin and development of the various breeds of farm animals. Their leading characteristics. Practice in stock judging.

3 hrs., first semester; 2 hrs., second semester.  
4 units.

**\*5. Dairying.** Mr. \_\_\_\_\_

Production of sanitary milk on the farm, the management and care of a dairy herd, the composition and properties of milk, the manufacture of dairy products.

5 hrs., first semester. 4 units.

**6. Farm Management.** PROFESSOR CLOTHIER.

The course in farm management will deal with the laying out of ranches or farms with reference to arrangement of ditches, buildings, roadways, pumping plants; application of water—ridge culture, flooding on slopes, on dead levels; cultivation with reference to moisture, alkali, sediments, weeds, latent fertility, control of climatic conditions, management of alkali; crop production, successions and rotations, marketing of farm produce, business aspects of farming, such as shipping associations, markets, transportation, and farm bookkeeping.

3 hrs., second semester. 3 units.

**7. Irrigation Engineering.** PROFESSOR WATERBURY.

Measuring and handling of ditch water, pumping plants, steam and gasoline engines, electric motors.

5 hrs., first semester. 4 units.

**\*8. Soils.**

PROFESSOR CLOTHIER.

Origin, composition, and classification of soils; soil moisture and methods of conserving it, soil temperature and conditions influencing it, soil texture as affecting the supply of heat, moisture, and plant food; various culture methods in relation to soil texture, and plant food, surface tension capillarity, osmosis and diffusion as affecting soil conditions; root development, mechanical analysis of soils.

5 hrs., second semester. 4 units.

**\*9. Poultry Husbandry.**

MR. \_\_\_\_\_

The general care and management of poultry, production of poultry products for the market, diseases and pests, characteristics of breeds.

3 hrs., second semester. 3 units.

**\*10. Veterinary Science.**

MR. \_\_\_\_\_

Animal physiology, sanitation, symptoms of common diseases and pests, and their remedies.

5 hrs., second semester. 4 units.

**\*11. Feeds and Feeding.**

MR. \_\_\_\_\_

The principles of animal nutrition, composition and digestibility of various feeds, construction and use of silos, economical feeding of animals for various purposes, balanced rations.

3 hrs., second semester. 3 units.

**\*12. Principles of Breeding.**

MR. \_\_\_\_\_

Principles governing breeding of plants and animals. Mendel's Law of Hybrids, modern practice in breeding,

5 hrs., second semester. 4 units.

**\*14. Market Classes of Farm Animals. MR. \_\_\_\_\_**

Common classifications of horses, mules, cattle, sheep, and swine, used by market buyers.

2 hrs., second semester. 2 units.

**ASTRONOMY.**

PROFESSOR DOUGLASS.

The atmosphere of Southern Arizona is perhaps the best in the United States for astronomical observation, having smaller percentage of cloud and less average wind velocity than any other locality where records have been preserved. The dry air and 2400 feet elevation give Tucson such a clear sky that faint stars may be watched till they set behind the distant horizon; the fine weather, day after day, gives opportunity for consecutiveness of observation not obtainable elsewhere; a greater portion of the year is available, with less interference from air currents.

The course in astronomy is arranged especially to draw attention to these advantages, and, at the same time, to give that understanding of the motions of the earth and planets which is so important in many branches of engineering. The eight inch Harvard telescope with its Clark glass and the four and one-fourth inch Brashear telescope of the University will always be available for closer study of the heavenly bodies. Two excellent clocks with electric connections for transmitting time give opportunity for longitude, latitude and time observations. It is hoped in the coming year to install other

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\*Offered 1909-10

instruments that will take advantage of the exceptionally favorable conditions so peculiar to Arizona.

**1. Descriptive Astronomy.** PROFESSOR DOUGLASS.

The study of the sun, moon and planets and other celestial objects, with constant views of their telescopic appearance and discussion of the latest theories of the evolution of the universe and the condition of the planets. Non-mathematical; open to all students.

2 hrs., or an equivalent, both semesters. 4 units.

**2. Engineering Astronomy.** PROFESSOR DOUGLASS.

Latitude, longitude and time observations, and their reductions, with practice work; astronomical measurement; adjustment and handling of instruments. Required of sophomores in civil engineering.

3 hrs., or an equivalent, second semester. 3 units.

## BIOLOGY.

PROFESSOR THORNBUR, MISS TILLMAN.

The courses which follow are calculated to articulate with the work done in biology in the average western high school.

The Desert Botanical Laboratory of the Carnegie Institution of Washington, D. C., is located on the mountain just west of Tucson. In this laboratory, the southwest with its unique and, as yet, little investigated flora, gains what is destined to be one of the important centers of active, scientific research. The research facilities of the laboratory are all that could be desired, and the investigations upon the desert flora will appeal to students of botany from all quarters. In the light of the above,

the importance of the Desert Botanical Laboratory to the University of Arizona and especially to this department will be apparent.

1, 2. General Botany.

MISS TILLMAN.

The first part treats of histology and morphology, and the second part of elementary physiology of plants. Bergen and Davis, *Principles of Botany*, is used as a textbook. Open to all college students.

4 hrs., or an equivalent, both semesters, M T W TH,  
1-3. 8 units.

3, 4. Plant Geography.

PROFESSOR THORNBUR.

Discussion of factors governing plant distribution. Study of habitat and taxonomic groups of the native flora. Opportunity is offered for advanced work. Open to all students having an equivalent of Biology 1, 2.

4 hrs., both semesters. 8 units.

\*5, 6. General Zoology.

PROFESSOR THORNBUR.

A comparative study of the representative invertebrate types is made. Parker and Haswell's *Manual of Zoology*, is used as a textbook. Dodge's *Elementary Practical Biology* is used in the laboratory. Open to all college students.

4 hrs., or an equivalent, both semesters. 8 units.

**CHEMISTRY.**

PROFESSOR GUILD (ABSENT ON LEAVE, 1908-9) ASSIST-  
ANT PROFESSOR BENNER, MR. CALLOWAY.

The instruction in chemistry has two main objects in view: first, to promote general culture; and second to introduce students to technical work, especially in

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\*Omitted 1908-09.

mining. The first two years' work in general chemistry, qualitative and quantitative analysis, places the student in a position to take up advantageously the study of mining, agricultural chemistry or metallurgy.

**1, 2. General Chemistry and Quantitative Analysis.**  
ASSISTANT PROFESSOR BENNER AND MR. CALLOWAY.

Lectures and recitations illustrating the chemical properties of the elements and their compounds. Text-books, Newth's, *Inorganic Chemistry*, Elliot and Storer's, *Qualitative Analysis* and various reference books. Open to all students who have taken courses amounting to one year each in preparatory chemistry and physics.

2 hrs., and two 3-hr. laboratory periods, both semesters, T TH, 10, TH F, 1-4. 8 units.

**3. Quantitative Analysis.**

ASSISTANT PROFESSOR BENNER.

Laboratory practice with lectures and recitations; the work will be chiefly in gravimetric methods of analysis. Open to all students who have taken Chemistry 2.

4 hrs., or an equivalent, first semester, M T W, 1-4. 4 units.

**4. Volumetric Analysis.**

ASSISTANT PROFESSOR BENNER.

A continuation of the work in Chemistry 3, special attention being given to the methods of assaying employed in the West.

4 hrs., or an equivalent, second semester. 2 units if discontinued March 15th; otherwise, 4 units.

**5, 6. Special Quantitative Analysis.**

ASSISTANT PROFESSOR BENNER.

The analysis of water, gases, oils, minerals. Open to students who have taken Chemistry 4.

4 hrs., or an equivalent, both semesters. 8 units.

**\*7, 8. Organic Chemistry.**

PROFESSOR GUILD

Lectures on the carbon compounds; laboratory work in organic analysis and the preparation of organic compounds; vapor density and molecular weight determination. Open to students who have taken Chemistry 3, 4.

4 hrs., or an equivalent, both semesters. 8 units.

**\*9. Synthetic Chemistry.**

PROFESSOR GUILD.

The preparation of pure chemical compounds from the crude mineral products. Open to students who have taken Chemistry 4.

2 hrs., or an equivalent, first semester. 2 units.

**\*10. Physical Chemistry.**

PROFESSOR GUILD.

Lectures. Historical introduction leading up to a discussion of modern chemical theories. Open to students who have taken Chemistry 3.

2 hrs., second semester. 2 units.

**\*11, 12. Chemistry of the Rare Elements.**

ASSISTANT PROFESSOR BENNER.

The analysis and synthesis of uranium, molybdenum, tungsten, vanadium and cerium compounds. Open to students who have taken Chemistry 6, 9.

4 hrs., or an equivalent, both semesters. 8 units.

**CIVIL ENGINEERING.**

PROFESSOR WATERBURY.

The courses in this department have been arranged with special reference to the engineering development of the Southwest. Stress will be laid on surveying, railroad and structural work, and irrigation engineering. The design throughout the courses is to give the student a thorough and practical knowledge of the essential principles of his profession, and to teach the technical practice of the times, so far as possible, without sacrificing in other directions.

**1, 2. Surveying.**

PROFESSOR WATERBURY.

Use and care of surveying instruments, United States system of land surveys, city surveys, topographical and hydrographical surveying, mine surveying, and earthwork computations. Lectures, recitations, drawing, and fieldwork. Textbook, Johnson's *Surveying*. Open to students who have taken trigonometry, and who have taken or are taking Mechanic Arts, 1.

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\*Omitted 1908-9.

4 hrs. both semesters, M W F, 11 (lectures), and S, 9-12 (fieldwork). 8 units.

**\*3. Geodesy.** PROFESSOR WATERBURY.

Size and shape of the earth; latitude, longitude and azimuth determinations; base line apparatus; triangulation; and trigonometric leveling. Open to students who have taken Civil Engineering 1, 2, and Astronomy 2.

1 hr., first semester. 1 unit.

**6. Concrete and Masonry Construction.**

PROFESSOR WATERBURY.

The theory and practice in reinforced concrete construction. Foundations on land and in water, cofferdams, cribs, caissons, piers and abutments, retaining walls, dams, and arches. Open to students who have taken Civil Engineering 14.

3 hrs., and one 3-hour laboratory and drafting period, second semester. 4 units.

**\*7. Steel Mill Buildings.** PROFESSOR WATERBURY.

Graphical and analytical computation of stresses in roof and bridge trusses; a study of the details of structural steel designing; complete design with drawings, estimate of weights, and estimate of cost for a steel mill building. Text-book, Ketchum's *Steel Mill Buildings*. Open to students who have taken Civil Engineering 14.

2 hrs., and two 3-hour drafting periods, first semester. 4 units.

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\*Omitted 1908-9.

**\*8. Bridge Design.** PROFESSOR WATERBURY.

Computation of stresses due to moving loads upon various points of bridge structures; a detailed study of bridge designs and bridge erections; complete design with drawings, estimate of weights, and estimate of cost of a steel bridge. Text-book, Ketchum's *Design of Highway Bridges*. Open to students who have taken Civil Engineering 7.

2 hrs., and two 3-hour drafting periods, second semester. 4 units.

**\*9. Railroad Engineering.** PROFESSOR WATERBURY.

Preliminary and location surveys; simple and easement curves, turnouts and switches; principles of economic location as based upon cost of construction, operating expenses, alignment, and grades; maintenance of way. The fieldwork consists of the surveys for a railroad of sufficient length to secure familiarity with the methods of actual practice. Each student makes a complete set of notes, maps, profiles, calculations and estimates of cost. Text-book, Allen's *Railroad Curves and Earthworks*. Open to students who have taken Civil Engineering 1, 2.

3 hrs., and Saturday forenoons, first semester. 4 units.

**11. Hydraulics.** PROFESSOR WATERBURY.

Velocity and discharge from orifices, weirs, tubes and pipes; flow in sewers, ditches, canals and rivers; measurement of water power; water wheels of various

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\*Omitted 1908-9.

types. Text-book, Merriman's *Hydraulics*. Open to students who have taken Civil Engineering 1, 2 and Mathematics 4

4 hrs., first semester. 4 units.

**\*13. Principles of Irrigation.** PROFESSOR WATERBURY.

A study of the present condition of irrigation development in the United States; irrigation legislation; methods of establishing rights to water; a brief reference to the engineering principles relating to the construction and maintenance of canals and reservoirs and the various means of diverting and measuring water for use in irrigation. Text-book, Wilson's *Irrigation Engineering*. Open to students who have taken Civil Engineering 1, 2, 11, 14.

3 hrs., and one 3-hour laboratory and drafting period, first semester. 4 units.

**14. Materials of Construction.**

PROFESSOR WATERBURY.

The properties and uses of stone, brick, lime, cement, concrete, timber, iron, and steel. The computation of stresses in prisms, beams, columns, and shafts. Lectures, recitations, and laboratory work. Text-book, Merriman's *Mechanics of Materials*. Open to students who have taken or who are taking Mathematics 5, 6.

3 hrs., and one 2-hr. laboratory period, second semester. 4 units.

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\*Omitted 1908-9.

**\*15. Contracts and Specifications.**

PROFESSOR WATERBURY.

The essential elements of a contract; items included in various kinds of engineering contracts and specifications; the preparation of a complete set of specifications and a contract. Text-book, Johnson's *Engineering Contracts and Specifications*. Open to all college students.

2 hrs., first semester. 2 units.

**ECONOMICS.**

PRESIDENT BABCOCK, ASSISTANT PROFESSOR CHANDLER.

**1. Introduction to Economic Theory.**

ASSISTANT PROFESSOR CHANDLER.

A study of the main principles which underlie the science, with special reference to illustrations of their workings in the growth of industry and commerce in England and the United States. Although the work of this course is essentially theoretical, no opportunity is lost to supplement the study with practical illustrations drawn from business activities of today. Seager's *Introduction to Economics* is used as the basic text. Open to all college students.

3 hrs., first semester, M W F, 10. 3 units.

**2. Industrial and Tariff History of the United States.**

ASSISTANT PROFESSOR CHANDLER.

A study of the rise of the factory system in the United States, and the origin and development of the leading American industries. The history of the tariff from 1789 to 1909 and its influence upon the develop-

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\*Offered 1909-10

ment of manufacturing and the growth of trusts, as well as its effect upon wages and fixed salaries. Tariff reform. Open to all college students who have had Course 1.

3 hrs., second semester, M W F, 10. 3 units.

**\*2a. Money, Credit and Banking.**

ASSISTANT PROFESSOR CHANDLER.

A thorough study of the functions of money and its relation to credit instruments and institutions. Also the theory and history of banking, tracing the development from the 15th to the 20th century. The principal banking systems of Europe are studied with a view to finding ideas which may be adapted to American conditions in order to render the American system more nearly conformable to our growing financial and commercial needs. Recent financial crises and their connection with our present currency and banking system. Open to all college students who have had Course 1.

3 hrs., second semester. 3 units.

**\*3. Economic History and Commercial Geography.**

ASSISTANT PROFESSOR CHANDLER.

Commercial and industrial history from the middle of the 18th century. The development of industry and commerce is traced to the present time. The genesis and evolution of modern economic ideas. The latter part of the course will include a general review of modern world commerce and the chief resources as well as the

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\*Offered in 1909-10 and in alternate years.

different systems of transportation upon which commerce depends. Open to all college students.

2 hrs., first semester, T TH, 10. 2 units.

**\*4. Modern Business Organization.**

ASSISTANT PROFESSOR CHANDLER.

Twentieth century methods of organizing and carrying on business. Problems attending the expansion of corporate enterprise and the growth of trusts. Legal status of the corporation; relations of corporation to business supremacy; methods of promotion and capitalization; monopoly price and methods; effect of trust development upon prices, wages and profits; the struggle of the independent entrepreneur; relation of government to industrial and commercial enterprise; railway rate regulation and anti-trust laws. Open to all college students who have had course 1 or 4.

2 hrs., second semester, T TH, 11. 2 units.

**\* \*5. History and Development of Industrial Society.**

ASSISTANT PROFESSOR CHANDLER.

A study of industrial development from the 12th to the 20th century with a view to finding the origin of modern social and industrial institutions, customs and rights, the historic foundation of special rights and privileges enjoyed by various classes today, including English common law rights of employer and employee, right to own and enjoy private property, freedom of contract, etc. Special attention will be given to the varying

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\*Offered in 1909-10, and alternate years.

\*\*Offered in 1910-11, and alternate years.

application of these rights to the new conditions accompanying the industrial revolution and the spread of the factory system. Also an inquiry into the relation existing between the efficiency of man as a factor in production and the conditions which surround him in his home and social life.

2 hrs., first semester. 2 units.

**\* \*6. The Labor Question.**

ASSISTANT PROFESSOR CHANDLER.

This course logically follows Course 6. It will consist of an intensive study in a limited field of the problems set forth in Course 6 as they affect the status of the laboring population today. In addition to the history and growth of labor organizations, place will be given to the following questions: strikes and lockouts, the closed shop, the secondary boycott, organized labor vs. organized capital, federal intervention, the use of the injunction and recent judicial decisions, the effectiveness of unions in raising the standard of living, etc.

2 hrs., second semester. 2 units.

**PUBLIC LECTURES.**

1909—10

In connection with the departments of history and economics, a series of lectures dealing with practical problems of the day will be given during the year 1909-10. These lectures, open to the public, will be given by business and professional men of Arizona, upon subjects

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**\*\*Offered in 1910-11 and alternate years.**

concerning which the speakers can present first-hand knowledge. The chief purpose in offering these lectures is to bring the students of economics into actual contact with the practical side of the questions with which the science deals. The following is a list of the lectures which will be given:

**October 1. Life Insurance—Its Relation to the Public and the Individual.**

MR. F. O. BRISTOL, General Agent for the Northwestern Mutual Life Insurance Company in Arizona, Phoenix.

**October 22. Our Farmers and Our Future.**

DIRECTOR ROBERT H. FORBES, Agricultural Experiment Station, University of Arizona, Tucson.

**November 12. The Invisible Empire.**

MR. ALLEN T. BIRD, Editor of the "Oasis," Nogales.

A discussion of the railway development now taking place on the west coast of Mexico, under Arizona engineers, and the value thereof to the people of Arizona.

**December 5. The Economic Aspects of Mining.**

COLONEL WILLIAM HERRING, General Attorney for the Copper Queen Consolidated Mining Company, Tucson.

**December 17. The Economic Importance of Government Reclamation Work, with Especial Reference to Work in Arizona. (Illustrated).**

MR. LOUIS C. HILL, Supervising Engineer of the United States Reclamation Service, in charge of all work in Arizona and Southern California.

January 15. **The Relation of the Press to the Development of Arizona.**

COLONEL JAMES H. MCCLINTOCK, Postmaster, Phoenix.

February 4. **Principles and Practice in the Making of Railroad Freight Rates.**

MR. H. T. CORY, Assistant to the President of the Randolph Lines.

February 19. **Railroads and their Relation to the Increase of Population and Wealth in Arizona.**

MR. FRANK COX, Chief Counsel for the Southern Pacific Company in Arizona, Phoenix.

March 11. **The United States Consular Service.**

HON. THOMAS F. WILSON, Formerly in United States Consular Service, Tucson.

March 25. **The Purpose and Work of Commercial Organizations, with Special Reference to the Tucson Chamber of Commerce and its Relation to the Development of Arizona.**

MR. H. V. FAILOR, Secretary of the Chamber of Commerce, Tucson.

### ENGLISH.

PROFESSOR BATES, MISS LUTRELL, MR. WALDRON.

The purpose of the literary courses outlined below is to give a general knowledge of English literature from its beginnings to the present time, chief stress being laid upon the study of representative authors, but with broader literary movements constantly in mind. The courses in composition aim to develop accurate thought and clear, vigorous expression; opportunity for work in

advanced composition is afforded in connection with the courses in literature.

**1. Composition.**

PROFESSOR BATES (1908-09) and MR. WALDRON.

Narration and description; lectures and the study of Nettleton's *Specimens of the Short Story*; daily and weekly themes. Prescribed for all freshmen.

3 hrs., first semester, M W F, 10. 3 units.

**2. Composition.** PROFESSOR BATES and MR. WALDRON.

Exposition and argumentation; study of Perry's *Argumentation*, class debates, impromptu speeches, and frequent themes. Prescribed for all freshmen.

3 hrs., second semester, M W F, 10. 3 units.

**3, 4. Nineteenth Century Prose.**

MR. WALDRON (PROFESSOR BATES, 1909-10).

From the publication of the Lyrical Ballads to the death of Ruskin, 1798-1899. The following writers are studied: Lamb, Hazlitt, Leigh Hunt, Landor, DeQuincey, Macaulay, Thackeray, Carlyle, Ruskin, Newman, Arnold, and Stevenson. Weekly papers on assigned topics; lectures and discussions. Primarily for freshmen.

2 hrs., both semesters, T TH, 10. 4 units.

**5, 6. Elizabethan Drama.**

PROFESSOR BATES.

Attention is given first to the development of the Elizabethan Drama from the Miracle Plays, Moralities, and Interludes; the Senecan influence is studied, and the work of Lyly, Greene, Peele, Kyd, and Marlowe briefly considered; then the bulk of the year is given to a close, detailed study of the leading plays of Shakespeare, fol-

lowed by a cursory treatment of the post-Shakespearian drama, at least one play being read from each of the following writers: Jonson, Beaumont and Fletcher, Heywood, Webster, Middleton, Massinger, and Ford. Lectures and discussions, and a thesis of not less than 2,000 words.

3 hrs., both semesters, T T H F, 11. 6 units.

**\*7, 8. Eighteenth Century Prose. PROFESSOR BATES.**

From the death of Dryden to the publication of the Lyrical Ballads (1700-1798). The following writers are studied: Swift, Addison, Steele, Defoe, Richardson, Fielding, Smollett, Sterne, Johnson, Goldsmith, Burke, Walpole, Beckford, Burney. Weekly papers on assigned topics, lectures, and discussions.

2 hrs., both semesters, 4 units.

**11. Poetry prior to the Nineteenth Century.**

PROFESSOR BATES.

This course affords a brief introductory view of Anglo-Saxon literature (in translation), a discussion of medieval romances and ballads, and a study of Elizabethan lyrics, Spenser, Milton, the Augustans, and the forerunners of romanticism in the eighteenth century. Weekly papers on assigned topics, lectures, and discussions.

3 hrs., first semester M W F, 8. 3 units.

**12. Poetry of the Nineteenth Century.**

PROFESSOR BATES.

This course gives opportunity for the study of the

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\*Omitted 1908-09, 1909-10.

following writers: Wordsworth, Coleridge, Scott, Byron, Shelley, Keats, Landor, Tennyson, Mrs. Browning, Robert Browning, Arnold, Rossetti, Morris, and Swinburne. Weekly papers on assigned topics, lectures, and discussions.

3 hrs. second semester M W F at 8. 3 units.

**\*17. American Literature.** PROFESSOR BATES.

Lectures upon pre-revolutionary conditions, the Knickerbocker and New England schools, the contribution of the South, the National literature since the Civil War. Special study of Irving, Cooper, Bryant, Hawthorne, Emerson, Whittier, Holmes, Longfellow, Lowell, Poe, Lanier, and Whitman. 2 hrs. first semester. T TH, 8.

**\*18. Contemporary Literature.** PROFESSOR BATES.

The aim of this course is to afford such a study of British and American literature in the last quarter-century as will enable the student to form a clear estimate of present-day tendencies. It covers the decadent and symbolic schools of British poetry, the Irish movement, contemporary American poetry, the romantic and realistic schools of fiction, and the revival of the drama, with especial reference to the influence of Ibsen. Readings assigned in the poetry of James Thomson, Wilde, Symons, Henley, Johnson, Yeats, Hovey, and Carman; in the novels of Kipling, Hewlett, Gissing, and Mrs. Ward; in the dramas of Ibsen, Pinero, Jones, Shaw,

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\*To be offered 1909-10.

and Phillips. Lectures upon these and other authors.

2 hrs., second semester, T TH, 9. 2 units

**13, 14. Chaucer.**

MISS LUTRELL.

In this course a large part of the *Canterbury Tales* is read, the *Prologue to the Legende of Gode Wommen*, and some of the minor poems. The course is purely literary and a knowledge of Anglo Saxon is not required.

3 hrs., both semesters, T TH F, 9. 6 units.

**\*15, 16. Nineteenth Century Fiction.**

PROFESSOR BATES.

Lectures upon the lives and general position of the following authors: Austen, Scott, Dickens, Thackeray, Emily Bronte, Charlotte Bronte, George Eliot, Reade, Meredith, Hardy, and Stevenson. One work is read from each of these writers, and its intellectual substance, literary style, plot, characterization, and atmosphere are discussed. A note-book containing impressions and analyses of the reading is kept by every student.

2 hrs., both semesters, 4 units.

**†19, 20. Principles of Literary Criticism.**

PROFESSOR BATES.

For graduate students and seniors obtaining special permission. The course is designed both to develop ability in research work, and to enable the student from his examination of critical theory to form satisfactory canons of taste. It is conducted as a seminar with reports and theses. In the first semester the following authors are studied: Plato, Aristotle, Sidney,

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\*Omitted 1909-10.

†To be offered 1909-10.

Dryden, Addison, Pope, Johnson, and Burke. The second semester is devoted to writers of the nineteenth century, especially Wordsworth, Coleridge, Shelley, Poe, Lanier, Arnold, Pater, and various contemporary critics.

Hours and credits to be arranged.

## FRENCH.

PROFESSOR TURRELL, MISS ALDRICH.

### 1, 2. Elementary French. MISS ALDRICH.

First semester: Fraser and Squair, *French Grammar*, (Part I), Aldrich and Foster, *French Reader*. Second semester: Reading of Daudet, *La Belle Nivernaise*, Labiche and Martin, *La Poudre aux Yeux*, Halevy, *L'Abbe Constantin*. Composition and dictation, with drill on the irregular verbs.

5 hrs. both semesters, M T W TH F, 2:40. 8 units.

### 3, 4. Advanced French. MISS ALDRICH.

First semester: Fraser and Squair, *French Grammar*, (Part II), Merimee, *Colomba* or *Carmen*, Lamartine, *Graziella*, Sand, *La Mare au Diable* or *La Petite Fadette*. Second semester: Selected reading, including Canfield, *French Lyrics*, Victor Hugo, *Les Miserables* (abridged).

5 hrs., both semesters M T W TH F., 8 units.

### 5. French Literature to the Nineteenth Century.

PROFESSOR TURRELL.

The classical French dramatists. Reading of plays of Corneille, Racine and Molière. Lectures on the eighteenth century. Voltaire, Rousseau, Diderot, etc.

Beaumarchais, *Le Barbier de Seville*. Library readings.  
3 hrs., first semester. 3 units.

**6. French Literature in the Nineteenth Century.**

PROFESSOR TURRELL.

Particular study of the drama. The Romanticists. Victor Hugo, Musset, Scribe, Augier, etc. Recent literary movements in France. Pailleron, Dumas, Rostand, Zola, Sardou, Hervieu, Maeterlinck, etc.

3 hrs., second semester. 3 units.

**\*7, 8. Advanced French Composition.**

PROFESSOR TURRELL.

Vreeland and Koren, *French Syntax and Composition*, Kron, *French Daily Life*, etc. Original essays and reports in French.

2 hrs., both semesters. 4 units.

Courses 5, 6, 7, 8 may be taken together or separately, but must be preceded by courses 1, 2, 3, 4.

**GEOLOGY.**

PROFESSOR TOLMAN AND MR. TARR.

The earlier courses in geology are constructed not only to introduce the student to general and applied geology, but with special reference to the development of the observational faculties, and training in inductive and deductive reasoning so that the student may discover for himself the causes for each phenomenon observed. The more advanced courses are technical and cover the essentials in geology for a mining engineer.

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\*To be given 1909-10.

The courses in geological mapping allow the student to take advantage of the opportunities at hand for field work, and include reconnaissance and detailed field mapping and underground geological mapping. Special field work can be undertaken by advanced students under the direction of the department.

**1, 2. General Geology.** PROFESSOR TOLMAN.

Geological processes, their causes and effects. The atmosphere, surface and underground water, the ocean and the ice and snow as geological agents. Earth movements; mountain and continent building; vulcanism. Rocks, their origin and alterations. Historical Geology, reviewing the physical history of the earth and correlated life progress.

The laboratory work covers the reading and interpretation of topographical and geological maps, the fundamentals of geological mapping, structural problems, and stereogrammatic and graphic methods for the solution of problems in faulting. Short field trips are taken in the second semester. Open to students who have taken or who are taking Mineralogy 1, 2.

3 hrs. and one laboratory period, both semesters,  
M T W TH, 8. 8 units.

**\*3. Economic Geology—Non-Metallic Products.**

PROFESSOR TOLMAN.

Statistics, production, utilization, value, occurrence, genesis, and methods of investigation of iron and manganese and the non-metallic products, viz.: coal, oil, gas, bitumen,

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\*To be given 1909-10.

etc.; building stones, clays, cement materials, sands, etc.; borax, phosphates, fluorspar, gypsum, graphite, mica, asbestos, mineral paints, etc.; salines, mineral waters, artesian flows, and investigation of underground water flow, etc.; precious stones.

3 hrs., first semester. 3 units.

**\*4. Economic Geology—Metallic Products.**

PROFESSOR TOLMAN.

Detailed study of ore deposits. Prerequisite, Geology 1, 2.

3 hrs., second semester, 3 units.

**\*\*5, 6. Field Geology.** PROFESSOR TOLMAN and MR. TARR

Construction of maps and sections. United States Geological Survey methods of geological mapping. Geological mine mapping and stereography. Two detailed geological maps are required of each student, one of a portion of the Tucson mountains (lava flows) and one of a district in the Rincon mountains (faulted and folded sedimentary rocks), a sketch reconnaissance map, and a geological map of mine workings. Open to students who have taken or are taking Geology 3, 4 and Mineralogy 3, 4.

All day Saturdays, or equivalent, in the field, both semesters. 8 units.

**\*\*7. Type Fossils.**

PROFESSOR TOLMAN.

Identification of the type fossils, especially of the Paleozoic.

2 hrs., first semester. 2 units.

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**\*\*Omitted 1908—9.**

GRADUATE WORK. Advanced work in Economic and Field Geology can be arranged for those working for the Master's Degree or that of Engineer of Mines.

### GERMAN,

PROFESSOR TURRELL, MISS ROBERTS.

#### 1, 2. Elementary German. MISS ROBERTS.

First semester: Bacon, *New German Course*, complete. Second semester: Reading of Storm, *Immensee*, von Hillern, *Hoher als die Kirche*, Manley and Allen, *Four German Comedies*. Composition, dictation and continued grammar drill.

5 hrs., both semesters, M T W T H F, 2:40. 8 units.

#### 3, 4. Advanced German. PROFESSOR TURRELL.

First semester: Pope, *German Composition*, with review of Syntax. Reading of Meyer-Foerster, *Karl Heinrich*, Heine, poems and *Die Harzreise*. Second semester: Composition continued. Lessing, *Minna von Barnhelm*, Schiller, *Wilhelm Tell*, etc.

5 hrs., both semesters, M T W T H F, 1:50. 8 units.

#### \*5, 6. German Literature in the Nineteenth Century.

PROFESSOR TURRELL.

First semester: The Romanticists and their successors. Class reading of Kleist, *Der Prinz von Homburg*, Grillparzer, *Der Traum ein Leben*, *Die Ahnfrau*, etc. Second semester: The rise of Naturalism and Symbolism. Wildenbruch, *Harold*, Fulda, *Der Talisman*, Sudermann, *Johannes*, Hauptman, *Die versunkene Glocke*. Lectures and library readings.

2 hrs., both semesters. 4 units.

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\*Omitted in 1908-9.

Courses 5, 6, 7, 8 may be taken together or separately, but must be preceded by courses 1, 2, 3, 4.

**\*7, 8. Lessing, Schiller and Goethe.**

PROFESSOR TURRELL.

First semester: Reading and interpretation of Lessing, *Emilia Galotti*, *Nathan der Weise*, Schiller, *Maria Stuart*, *Wallenstein*. Accompanied by a brief outline of German Literature to the nineteenth century. Second semester: Goethe, *Hermann und Dorothea*, *Egmont*, *Die Italienische Reise*, *Faust*, Part I.

3 hrs., both semesters. 6 units.

**GREEK.**

MRS. NEWSOM.

**1, 2. Beginner's Course.**

MRS. NEWSOM.

The work done is represented by White's *First Greek Book*; Goodwin's *Greek Grammar*; and Xenophon's *Anabasis* (first four books).

5 hrs., both semesters, M T W TH F, 9:50. 8 units.

**\*3, 4. Homer and Plato.**

MRS. NEWSOM.

Homer's *Iliad* (first 4 books); Plato's *Apology* and *Crito*; and selections from Lysias.

5 hrs., both semesters. 8 units.

**HISTORY.**

PRESIDENT BABCOCK, ASSISTANT PROFESSOR CHANDLER.

In the work in history emphasis is placed on the social and political development, the relation of cause and effect, and the unity of history. The laboratory

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\*To be given in 1909-10.

method is used whenever possible and individual work insisted upon.

**\*1, 2. Political and Constitutional History of England.**

ASSISTANT PROFESSOR CHANDLER.

This course will cover the political history from Anglo-Saxon times to the battle of Waterloo. The development of the English constitution and the origin of other political and legal institutions contributed by England to modern civilization will be studied. Gardiner's *Students' History of England* is used as the general text, with Montague's *Constitutional History* for collateral study. Assigned readings, preparation of frequent reports and consultation of original sources where practicable. Open to all college students.

4 hours, both semesters. 8 units.

**\*3, 4. American Colonial History. PRESIDENT BABCOCK**

A detailed study of the American colonies under Great Britain, and of the United States to the adoption of the Constitution. Lectures, assigned reading and reports. Open to students who have taken History 1, 2.

3 hrs., both semesters. 6 units.

**5, 6. Constitutional History of the United States.**

PRESIDENT BABCOCK.

A detailed study of the formation of the Union and of the political and constitutional history of the United States down to 1856, based on letters and speeches of American statesmen, public documents and special

histories. Open to students who have taken History 1, 2.

3 hrs., both semesters, T T H S, 8. 6 units.

**7, 8, Great Movements in History.** PRESIDENT BABCOCK.

Lectures, with readings, on the great forces of history and the forms of their manifestation—migrations, religions, political and economic revolutions, etc.

2 hrs., both semesters, M W, 11 4 units.

**\*9. The French Revolution and the Napoleonic Period.**

ASSISTANT PROFESSOR CHANDLER.

The causes, events and results of the French Revolution, and the spread of reform under Napoleon. The study of the revolution will be prefaced by a review of the state of European civilization in the middle of the eighteenth century and the influence of the French and English schools of literature, philosophy and economics as factors in the political and economic revolutions. Open to all college students.

3 hrs., first semester. 3 units.

**\*10. European History since the Congress of Vienna.**

ASSISTANT PROFESSOR CHANDLER.

A study of the liberal and reform movements, social, political, economic and intellectual, up to the present time; the evolution of constitutional government; the various movements towards national unity; the revolts of 1820, 1830 and 1848; the Eastern question; the Franco-Prussian war and the rise of Germany to a commanding position in World commerce and politics; English reform bills of 1832 and 1867, and other political, religious and

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\*To be offered 1909-10.

social-industrial reforms. Open to all college students.  
3 hrs., second semester. 3 units.

## LATIN.

MRS. NEWSOM.

The courses below are open to students who have completed the first three years of Latin in the sub-collegiate department, or an equivalent. Constant thorough drills are given in technical grammar and prose composition. In reading, the matter is subjected to grammatical, metrical, rhetorical and historical explanation. The study of the text is made the means of mental discipline, of developing the faculties of observation and critical judgment, and of acquiring habits of thoroughness and accuracy.

1, 2. Virgil, Livy, and Cicero. MRS. NEWSOM.

Virgil, *Æneid*, Books V and VI; Livy, Selections; Cicero, *de Senectute*, *de Amicitia*. Exercises in prose composition.

4 hrs., both semesters. 8 units.

3, 4. Tacitus and Horace. MRS. NEWSOM.

Tacitus, *Germania* and *Agricola*, Selections from Histories; Horace, *Odes*.

3 hrs., both semesters. 6 units.

## MATHEMATICS.

PROFESSOR E. M. BLAKE, ASSISTANT PROFESSOR MEDCRAFT.

College Algebra. ASSISTANT PROFESSOR MEDCRAFT

One-fifth of the time of the course in college algebra is devoted to graphical methods. Prescribed for all freshmen in engineering courses.

4 hrs., and a 2-hr. laboratory period, first semester,  
M W TH F, 9, T, 8-10. 5 units.

## 2. Analytical Geometry.

ASSISTANT PROFESSOR MEDCRAFT.

The fundamental methods of analytical geometry; the straight line and circle; the properties of the conic sections; problems in loci; graphical solutions of equations. Prescribed for all freshmen in engineering courses.

4 hrs., and a 2-hr. laboratory period, second semester, M W TH F, 9, T, 8-10. 5 units.

## 3. Differential Calculus. PROFESSOR BLAKE.

The fundamental principles and formulae of the differential calculus, with their applications. Prescribed for sophomores in all engineering courses.

3 hrs., first semester, M W F, 9. 3 units.

## 4. Integral Calculus. PROFESSOR BLAKE.

The fundamental principles and formulae of integral calculus, with their applications. Prerequisite, Mathematics 3. Prescribed for sophomores in all engineering courses.

3 hrs., second semester, M W F, 9. 3 units.

## 5, 6. Analytical Mechanics. PROFESSOR BLAKE.

The mathematical treatment of the fundamental principles of dynamics and statics. illustrated and applied. Prerequisites, Mathematics 4, and Physics 1, 2.

4 hrs., and a 2-hr. laboratory period, first semester, and 4 hrs., second semester, M T W TH, 10. 9 units.

## MECHANIC ARTS

PROFESSOR HENLEY, MR. TARR.

The courses in Mechanic Arts comprise the elements of shop work and drawing. The work consists of lectures, recitations and drawing, tool and machine work. The courses are designed with special regard for the needs of the students in engineering, an effort being made to familiarize the student with the ordinary methods in shop work, a knowledge of which is valuable to every engineer, rather than to develop the skill of the mechanic

### 1. Mechanical Drawing.

PROFESSOR HENLEY and MR. TARR.

Elements of mechanical drawing, including lettering, tracing and blue printing. The subject is treated in a purely mechanical way, the object being to enable the student to learn to make and read ordinary working drawings, and to give him some knowledge of ordinary drafting room practice.

2 laboratory periods, first semester, T W, 1-4. 2 units.

### 2. Descriptive Geometry. PROFESSOR HENLEY.

Elements of descriptive geometry, including problems in warped surfaces and intersection of solids.

2 lecture and laboratory periods, second semester, T W, 1-4. 2 units.

### 3. Wood Shop. PROFESSOR HENLEY.

Bench and machine work; elements of pattern and foundry work. Note books required.

2 periods, first semester, M, 1 (lecture), 2-4 (shop), S, 9-12 (shop). 2 units.

**4. Forge Shop.**

PROFESSOR HENLEY.

Forge work in iron and steel; tempering, case-hardening and annealing. A study of those characteristics of iron and steel which affect their working in the shop. Note books required.

2 periods, second semester, M, 1 (lecture), 2-4 (shop), s 9-12 (shop). 2 units.

**5, 6. Machine Shop.**

PROFESSOR HENLEY.

This course includes the elements of machine shop practice, and the erection and care of machinery. The student is given work on the drill press, shaper, lathe, and planer, as well as at the bench and on the erecting floor. Only the ordinary classes of work are taken up, the object being to make it as much as possible, a general engineering course. Open to students who have had courses 1, 3, 4, or an equivalent.

2 periods, both semesters, TH, 1 (lecture), 2-4 (shop), F, 1-4. 4 units.

**7, 8. Advanced Machine Shop Practice.**

PROFESSOR HENLEY.

This course is designed for students in mechanical engineering, or others who require a more thorough course than is given in courses 1, 3, 4, 5, 6. It continues the work of these courses and in addition takes up the various standard manufacturing methods. The work consists of shop work, lectures and reading, the equivalent of two half-days a week, both semesters, the hours to be arranged with the instructor. 4 units.

**MECHANICAL ENGINEERING.**

PROFESSOR E. M. BLAKE.

**1. Heat Engines.** PROFESSOR BLAKE.

Principles of thermodynamics as applied to steam and internal combustion engines. Study of the general structural features and methods of operating the more important types of boilers, and steam and gasoline engines.

2 hrs. and a 3-hrs. laboratory period, first semester,  
T TH, 8, M, 1-4. 3 units.

**2. Dynamo-Electric Machinery.** PROFESSOR BLAKE.

Theory underlying the generation, transmission, and utilization of electric currents. Description of the more important types of generators and motors. Prerequisite, Mechanical Engineering 1.

2 hrs. and a 3-hrs. drafting period, second semester,  
T TH, 8, M, 1-4. 3 units.

**3, 4. Kinematics of Machinery and Elements of Machine Design.** PROFESSOR BLAKE.

Theory and design of linkages, gears, cams, screws, and other machine elements.

1 hr. and two 2-hrs. drafting periods, both semesters.  
6 units.

**5, 6. Mechanical Laboratory.** PROFESSOR BLAKE.

Operation, inspection, and testing of boilers, steam and gasoline engines, compressed air machinery and pumps.

1 hr. and two 3-hrs. laboratory periods, both semesters. 6 units.

**\*7, 8. Machine Design.**

PROFESSOR BLAKE.

Exercises in the designing of complete machines, such as a steam or gas engine, a pump, a compressor, a mine hoist, or a locomotive.

1 hr. and one 2-hrs. drafting period, both semesters.  
4 units.

**\*9, 10. Power Plant Design and Economics.**

PROFESSOR BLAKE.

Study of machinery installations as to arrangement of parts, adaptability to intended work, and economy of first cost and operation. Exercises in writing specifications and designs of such installations as the boiler plant and engines of an electric generating station, a pumping station for a water works, an air compressing plant for a mine, or a stamp mill. As part of this course trips will be made to the mining districts of Arizona and Sonora, usually one or two weeks in March or April.

1 hr. and two 2-hrs. drafting periods, both semesters.  
6 units.

**METALLURGY.**

PROFESSOR GOODRICH.

**1. Introduction to Metallurgy.** PROFESSOR GOODRICH.

Physical properties of metals, alloys, thermal treatment of metals, thermal measurements, fuel, refractory materials, metallurgical processes, furnaces, thermochemistry, metallurgy of iron and steel. Seniors in

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\*Omitted 1908-9.

Mining Engineering and Metallurgy. Lectures and recitations.

4 hrs. for 1 month, first semester, 1 unit.

**2. Fire Assaying.** PROFESSOR GOODRICH.

Fire assay for gold, silver and lead. Bullion assays. Prerequisite, Chemistry 3, 4.

15 hrs., or an equivalent, second semester (March, April, and May). 2 units.

**3. Metallurgy of Gold and Silver.**

PROFESSOR GOODRICH.

Stamp milling, chlorination, cyaniding, pan-amalgamation; Patio, Cazo, Fondon, Krohnke, and Tina processes, hyposulphite leaching practice, etc. Lectures and recitations. Prerequisite, Metallurgy 1, 2.

4 hrs., first semester (except first month), T, 4, W F, F 8 3 units.

**4. Metallurgy of Lead and Copper.**

PROFESSOR GOODRICH.

Sampling, receiving, purchasing, roasting; blast furnace methods, reverberatory furnace methods; pyritic smelting, converting, desilveration of base bullion, electrolytic refining, hydro-metallurgy of copper, etc. Lectures and recitations. Prerequisites, Metallurgy 1, 2, and 3.

4 hrs., second semester, T, 4, W F, 1 F 8. 4 units.

**5A. Metallurgical Laboratory.** PROFESSOR GOODRICH.

Amalgamation, cyaniding, chlorination, hypo-sulphite lixiviation, etc., tests, together with mill work.

This course runs parallel with Metallurgy 3. Lectures.  
One weekly period, first semester. 1 unit.

**5B. Metallurgical Laboratory.**

Sampling, concentration, mill work. This course runs parallel with Metallurgy 7. Lectures.

One weekly period, first semester. 1 unit.

**6. Advanced Metallurgical Laboratory.**

PROFESSOR GOODRICH.

This course is a continuation of Metallurgy 5 (mill work), for such students as have completed Metallurgy 5, and who desire more practical experience in ore testing. New machinery is being constantly added to the mill, which becomes available for this course.

2 periods, second semester. 2 units.

**7. Ore Dressing.**

PROFESSOR GOODRICH.

Breaking, crushing, separating, concentrating, sampling; mill processes and management. Lectures and recitations. Prerequisites, Chemistry 3, 4, and Metallurgy 2.

3 hrs., first semester, M W F, 11. 3 units.

**\*8. Metallurgy of Rare Metals.** PROFESSOR GOODRICH.

Metallurgy of zinc, cadmium, nickel, mercury, bismuth, tin, antimony, cobalt, platinum, tungsten, molybdenum, Lectures and recitations. Prerequisites, Metallurgy 1, 2, and 3.

2 hrs., second semester. 2 units.

**9. Excursions.** See Mining Engineering 7, 8.

**MINING ENGINEERING.**

PROFESSOR TOLMAN, MR. TARR.

In this course attention is largely directed to the economics of mining, and the laboratory and drafting work is so arranged that the student will have plans and designs which will be of value in the practice of the profession.

**1, 2. Lectures on Mining.**

PROFESSOR TOLMAN and MR. TARR.

Locations of claims; mining laws of the important mining countries of the world; prospecting; excavations, tunnels, shafts, and methods of timbering; underhand, overhand, square sett, filling and caving methods of mining; pumping; ventilation; transportation; hoisting; mining machinery, its installation; and surface improvements of mines.

Methods for undeveloped properties compared with those for developed mines. Mine accounts, cost sheets, stope sheets, assay plans; methods of management, mine sampling and mine reporting.

2 hrs., both semesters (1909-1910). 4 units.

**3, 4. Laboratory in Mining.**

PROFESSOR TOLMAN and MR. TARR.

The study and designing of timbering, and mining constructions of all kinds, ore bins, head gear, pumping devices, etc.

One 3-hrs. laboratory period, both semesters. 2 units.

**5, 6. Technical Mining Literature.**

PROFESSOR TOLMAN and MR. TARR.

The summarizing of the current literature on mining, and arrangement of a card index of the same.

One 3-hrs. laboratory period, both semesters, 2 units.

### 7. Practical Mining.

Before entering upon the work of the Senior year, all students who are candidates for the degree of B. S. in Mining must have spent at least four weeks in practical underground mining, or for the degree of B. S. in Metallurgy four weeks in a metallurgical plant, or in underground mining, preferably the former. The fulfillment of this requirement must be evidenced by the certificate of the mine superintendent or foreman, and by notes and sketches of the processes observed, to be presented to the faculty of the School of Mines, and discussed with them.

In connection with the courses in mining engineering and metallurgy, trips will be made to mining districts in Arizona and Sonora, usually one or two weeks in March or April. These trips are required of all candidates for the degree of B. S. in Mining Engineering and Metallurgy.

The purpose of these trips is to afford the student an opportunity for close study and inspection of mining and metallurgical plants, and of rock formations and of minerals of commercial value. The students are accompanied by members of the faculty, and every effort is made to make the trips of the greatest practical value. The visits are carefully scheduled and notes, with sketches, measurements and photographs are taken, and elaborated into comprehensive reports by each student after the return.

During April, 1909, the mining district of Silverbell and the metallurgical plant at Sasco were visited in this way. The thanks of the University are due the superintendents of the various plants visited, for their efforts and care in acquainting the students with the work under their management.

## PHILOSOPHY AND EDUCATION.

MRS. STANLEY.

**1, 2. History of Philosophy.** MRS. STANLEY.

A study of the basal concepts and fundamental problems of philosophical thought as developed historically. Lectures, recitations and assigned reading. Text-book, Schwegler's *History of Philosophy*.

3 hrs., both semesters, M W F, 9. 6 units.

**\*3. Psychology.** MRS. STANLEY.

A special consideration of the subject as applied to teaching. Lectures, recitations and collateral reading. Open to Juniors and Seniors.

2 hrs., both semesters. 4 units.

**4. Pedagogy.** MRS. STANLEY.

An account of educational evolution, both as a culture fact in the history of civilization and as a foundation for professional work; lectures, giving a brief but comprehensive outline of school systems, a special study of leading educators such as Comenius, Pestalozzi, Froebel, Mann, and others; methods of teaching, school manage

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\*Omitted 1908-09.

ment and school law. Arrangements have been made with the Tucson city schools to provide practice work for this class. Open to students who have taken Philosophy 1.

2 hrs., both semesters, M W, 10. 4 units.

**\*5. Logic.**

MRS. STANLEY.

Textbook, Jevons' *Logic*; reading from Mill, Hamilton, Thompson and others. Open to Juniors and Seniors.

4 hrs., first semester. 4 units.

**\*6. Ethics.**

MRS. STANLEY.

Theoretical and practical ethics; view of the historical development of the science; origin and development of the moral consciousness; application of the principles of ethics to the problems of life. Lectures, discussions and assigned reading. Open to Juniors and Seniors.

3 hrs., second semester. 3 units.

**7. Philosophical Problems in Great Books.**

MRS. STANLEY.

A comparative study of interpretations of life as revealed in masterpieces of the world's literature.

This course is designed to meet the needs of students who cannot afford the time for advanced English or philosophy, as well as to supplement the course now offered in those departments. The programme as planned will include ten great books, viz.: *The Antigone of Sophocles*; *The Apology of Socrates*; *Plato's Republic*; *The Book of Job*; *Dante's Divine Comedy*; *Les Misérables*; *Faust*; *Tolstoi's Anna Karenina*; *Ibsen's Peer Gynt*.

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\*Omitted 1908-09.

Lectures and interpretative readings. Open as free elective to all Juniors and Seniors.

1 hr. both semesters, F, 8. 2 units.

### PHYSICAL TRAINING.

MR. KLEEGERGER, MISS MERRIMAN.

The department of physical training has general direction of the gymnastic and athletic activities of the University. The department aims to give the students such exercises, games, and sports as will best create and maintain a vigorous physical health, and to this end it strives to reach as many persons as possible, especially the weak and undeveloped, and to give to each one exercise that will at once benefit, interest, and stimulate. Physical training is prescribed for all freshmen and sophomores from October 1st to May 15th. With the approval of the director of the gymnasium, students may substitute some form of regular athletic work for the course in the gymnasium for specified periods.

#### A. Physical Examinations for Men. MR. KLEEGERGER

The examination includes about thirty measurements of the body, tests of strength, and examination of the heart, lungs and other vital organs, together with inspection for marks of vaccination and physical inequalities. Prescribed for all freshmen and sophomores at the beginning of the year, or upon entrance into these classes. A second examination is optional with the instructor, while a rigid and complete special examination by the University physician may be ordered at any time.

**1, 2. Gymnastics and Hygiene for Men.****MR. KLEEGERGER.**

Setting up exercises, calisthenic drills, indoor games, and simple apparatus work. Lectures on the physiology of exercise, personal hygiene, and corrective exercises. Required of all freshmen unless excused on recommendation of the University physician.

2 half-hour periods, both semesters. 1-2 unit.

**3, 4. Advanced Gymnastics.****MR. KLEEGERGER.**

A continuation of the work of the first year; the use of apparatus, parallel bars, horizontal bar, horses, rings; out-door runs, etc. When possible the class will be divided into graded sections for special work on the apparatus. Required of all sophomores unexcused by the University physician.

2 half-hour periods, both semesters. 1-2 unit.

**5, 6, 7, 8. Gymnastics for Women.****MR. KLEEGERGER AND MISS MERRIMAN.**

The work is prescribed for young women as for men, and resembles that for men in its general scope and aim. It is, however, modified to suit the needs of the young women, emphasis being laid upon poise, carriage, grace, and development. Music is used for class drills, marching, and dancing. A gymnasium suit is necessary, consisting of a loose blouse waist, divided skirt, and the regular gymnasium shoes. The waist has a sailor collar trimmed with white braid. Four yards of double width, 54-inch dark blue serge is required, if Butterick patterns are used; ready-made suits may be purchased

for about \$4 at the gymnasium. Required of freshman and sophomore years.

3 hrs., each semester, 2 units.

**B. Football, Baseball, Basketball, Tennis, and Field and Track Work.**

Recreative sports as a relaxation from study and as a means of development are recognized by the University in its provisions of fields, courts, etc., and by its acceptance of time devoted to such sports, with the approval of the director of the gymnasium, as satisfaction for part of the requirements in Physical Training. Save for the traditional seasons fixed for these sports by climatic conditions in other regions, they might all be indulged in throughout nearly the whole academic year, as is the case with tennis. The direct control and management of these sports and of the competitive games with outside teams, are vested in the Athletic Association of the University of Arizona, made up of both students and faculty, but officered by students. During the current year, contests have been held with the University of New Mexico, at Albuquerque, New Mexico, in football; with the Tempe Normal School, in Tempe and in Tucson, in baseball and tennis; with the Phoenix High School, in Phoenix and Tucson, in baseball; with the Bisbee High School, in basketball; and with the Tucson High School in baseball and basketball.

**MINERALOGY.**

PROFESSOR GUILD (ABSENT ON LEAVE, 1908-9,) PROFESSOR TOLMAN (IN CHARGE, 1908-9) MR. TARR.

The main object of the courses in mineralogy is to familiarize the student with facts and methods that will enable him to determine the character of an ore or mineral by observation of its physical properties and by the performance of a few simple tests with the blow-pipe, since in the field and mine recourse cannot usually be had to a well equipped chemical laboratory.

**1, 2. General Mineralogy.** PROF. TOLMAN, MR. TARR.

Lectures and recitations in crystallography and the classification and uses of minerals; laboratory work in blow-pipe analysis and determinative mineralogy; the study of a type collection of 600 minerals arranged and classified according to Dana. Text-books: Dana, *Text-book of Mineralogy*, and Brush, *Manual of Determinative Mineralogy and Blow-pipe Analysis*. Prerequisites: Chemistry 2 and Physics 2.

2 hrs., and two 3-hr. laboratory (blow-pipe) periods, first semester. 4 units (crystallography 2, blow-pipe 2). 3 hrs., or equivalent, second semester, 3 units.

**3. Advanced Crystallography.** PROFESSOR TOLMAN.

With microscopic study of the rock-forming minerals. Prerequisites: Geology 2 and Mineralogy 2.

2 hrs., or an equivalent, first semester. 2 units.

**4. Petrography.** PROFESSOR TOLMAN.

The preparation of thin sections of rocks for microscopic study, rock analysis, and the study of a type selection of rocks. Prerequisite, Mineralogy 3.

2 hrs., or an equivalent, second semester. 2 units.

**PHYSICS.**

PROFESSOR DOUGLASS.

The object of this course is to acquaint the student with the fundamental physical principles which underlie the higher courses of chemistry, mechanics and engineering. Note books are required in all courses.

**1, 2. General Physics.** PROFESSOR DOUGLAS.

Lectures, recitations and laboratory work. First semester: mechanics and heat. Second semester: Electricity, wave motion, sound and light. The laboratory experiments give prominence to general electrical measurement, but include the study of wave motions and their application so the other subjects. Prerequisites: a course in elementary physics and mathematics 1.

2 hrs.; and two 2-hr. periods in the laboratory, both semesters, M W F, 11-12, T TH, 10-12. 8 units.

**3. Thermodynamics and Heat.** PROF. DOUGLASS.

A study of the foundation principles underlying mechanical engineering, latent and specific heats, conductivity, expansion, mechanical equivalent, high temperatures, cycles, entropy, properties of steam, etc. Prescribed for third year in mechanical engineering course.

1 hr. and two 2-hr. periods, first semester. 3 units.

**4. Electrical and Optical Measurements.** PROF. DOUGLASS.

A study of the electrical machines and instruments used in mechanical engineering, and of the optical instruments handled in mining and civil engineering courses. Prescribed for the third year in mechanical and civil engineering courses. Two 3-hr. periods, second semester. 4 units.

**SOCIOLOGY.**

ASSISTANT PROFESSOR CHANDLER.

**\*1. Introduction to the Study of Sociology.**

ASSISTANT PROFESSOR CHANDLER.

A study of the underlying principles of social organization. A sketch of the development of the science up to date. The application of social principles to problems of contemporary society.

3 hrs., first semester. 3 units.

**\*2. Socialism and Social Reform.**

ASSISTANT PROFESSOR CHANDLER.

History of the rise and development of modern socialism. The progress of socialism with industrial revolution will be closely followed. A review will be made of the different French, German and English schools and of the present status of socialism as a political and practical reform movement in Europe and America.

3 hrs., second semester. 3 units.

**†3. Social Problems of Today.**

ASSISTANT PROFESSOR CHANDLER.

This course will deal with the most important problems which confront English and American societies, such as those attending the rapid development of cities and congested industrial centers, the slum, tenement house, child labor, the sweat shop, the liquor problem, race suicide, and increase of divorce. Some time will

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\*Omitted, 1908-1909.

†Offered in 1910-11 and alternate years.

be devoted to practical reforms now being tested, such as industrial education, factory legislation, juvenile courts, University settlements, etc.

2 hrs., first semester. 2 units.

### SPANISH.

PROFESSOR TURRELL, MISS ALDRICH.

1, 2. Elementary Spanish. MISS ALDRICH.

First semester: Hills and Ford, *Spanish Grammar*, Turrell, *Spanish Reader*, begun. Conversation and oral work. Second semester: grammar and reader completed; additional readings with composition and dictation.

5 hrs., both semesters. I, M T W TH F, 9; II, M T W TH F, 11:30. 8 units.

3, 4. Advanced Spanish. PROFESSOR TURRELL.

First semester: Reading of Johnson, *Cuentos Modernos*, Alarcon, *El Capitan Veneno*. Second semester: Galdós, *Marianela*, Valdes, *La Alegria del Capitan Ribot*, etc. Three hours each week during the first semester and two hours during the second will be given to composition, letter-writing and syntax, using Umphrey, *Spanish Composition* and Bonilla, *Spanish Daily Life*.

5 hrs., both semesters, M T W TH F, 1. 8 units.

5. Spanish Literature to the Nineteenth Century.

PROFESSOR TURRELL.

Lectures in Spanish on the early literature of Spain, the "Siglo de Oro," etc., with library readings. Class

study of Cervantes, *Don Quijote* (Selections), Lope de Vega, *La Estrella de Sevilla*, Calderón, *La Vida es Sueno*, etc.

3 hrs., first semester, M W F, 9. 3 units.

**6. Spanish Literature in the Nineteenth Century.**

PROFESSOR TURRELL.

Particular study of the drama. Reading of Moratín, *El Si de las Ninas*, Larra, *Partir a Tiempo*, Gutiérrez, *El Trovador*, Tomayo y Baus, *Lo Positivo*, Nunez de Arce, *El Haz de Lena*, Echegaray, *El Gran Galeoto*, Galdós, *Electra*.

3 hrs., second semester, M W F, 9. 3 units.

**\*7. General Survey of the Literature of the Countries of Spanish America.**

PROFESSOR TURRELL.

Class reading of Ugarte, *La Joven Literatura Hispano-americana*, Hills, *Bardos Cubanos*, Avellaneda, *Baltasar*, etc.

2 hrs., first semester, T TH, 9. 2 units.

**\*8. History of Mexican Literature.**

PROFESSOR TURRELL.

Reading of works by the best authors, as included in the *Biblioteca de Autores Mexicanos*, etc.

2 hrs., second semester, T TH, 9. 2 units.

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\*Omitted 1909-10.

**\*9, 10. Advanced Spanish Composition and Commercial Spanish.** PROFESSOR TURRELL.

A practical course in writing and speaking Spanish. Harrison, *Spanish Correspondence*, Remy, *Spanish Composition*, etc. will be used. Original essays, letters and reports in Spanish. (May be taken with courses 5, 6, but must be preceded by courses 1, 2, 3, 4.)

2 hrs., both semesters. 4 units.

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\*To be given in 1909-10.

## SHORT COURSE IN AGRICULTURE.

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This course is offered, first, to meet the demands of prospective homeseekers who desire to learn something about the general principles and practices of irrigation farming before engaging in actual farm operations in Arizona. Second, to give the young man who feels that he cannot afford the time or the means to pursue a full college course a brief introduction to some of the most important scientific principles and facts that are the basis of successful farming, before he settles down to his chosen business, as well as to give him a measure of that broad general culture that is always incidental to University life, and which makes so much for good citizenship. Third, to equip young men to take advantage of opportunities and to fill positions demanding more intelligence and skill than ordinary farm labor. Opportunities and positions for young men of such training are now open in Arizona and will become more frequent as the great reclamation projects being carried on are completed. As specific examples may be mentioned: First, the employment at present by the U. S. Reclamation Service and private ditch companies of many ditch superintendents, all of whom need special training for the work. These positions are constantly changing personnel and the number of such men so employed will more than double within the next

two years. The positions pay from \$75 to \$135 per month. Second, there are vast areas of desert land in Arizona that may be reclaimed by pumping, and the opportunities for development of this kind of irrigation farming have scarcely been touched; but to make the most of such opportunities one will need more mechanical skill and more knowledge of the physical properties of soil than the average farmer possesses. Courses in Irrigation Engineering, Farm Management, Soil Physics, Vegetable Gardening, Orchard Management, and Farm Dairying, are especially designed to equip young men to take advantage of these opportunities and positions.

#### ADMISSION.

Students will be admitted to the short course who have a general knowledge of the common school branches and sufficient maturity in years to understand the value of their time and opportunity. They will be accorded the same privileges, and required to observe the same regulations, as other students registered in the University and resident upon the campus.

#### EQUIPMENT.

The University is amply equipped with library, laboratory, and green-house facilities, while the development of a farm of 80 acres recently purchased will give opportunity for an abundance of practice in the application of the knowledge gained in the class room, library, laboratory and green houses.

The following outline of the course of study indicates the scope of the work done. In addition to the time

spent in the class room indicated below, students will be required to make at least two afternoons per week on the farm, for which they will be paid by the University.

## I YEAR.

## FIRST SEMESTER.

|                                         |   |
|-----------------------------------------|---|
| Breeds of Farm Animals..                | 3 |
| Plant Culture and<br>Orchard Management | 5 |
| Algebra.....                            | 5 |
| English.....                            | 5 |
| Drawing and Shop.....                   | 5 |

## SECOND SEMESTER.

|                        |   |
|------------------------|---|
| Breeds of Farm Animals | 2 |
| Farm Management....    | 3 |
| Gardening.....         | 3 |
| Algebra.....           | 5 |
| English.....           | 5 |
| Drawing and Shop.....  | 5 |

## II YEAR.

|                            |   |                                        |   |
|----------------------------|---|----------------------------------------|---|
| Feeds and Feeding.....     | 3 | Soils.....                             | 5 |
| Dairying.....              | 5 | Veterinary Science....                 | 5 |
| Poultry.....               | 3 | Principles of Breeding..               | 5 |
| Irrigation Engineering.... | 5 | Market Classes of Farm<br>Animals..... | 2 |
| Chemistry.....             | 5 | Chemistry.....                         | 5 |

## BUREAU OF MINES AND ASSAYING.

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A separate department of the School of Mines under the name of "The Bureau of Mines and Assaying" has been established to receive and work ores, and to make assays and analyses of ores, minerals, mineral waters and petroleum.

In accordance with the act of the Legislature of the Territory, approved March, 1897, and amended in March, 1899, assays of ores and minerals are made for the prospectors and miners of Arizona and for others at fixed rates established by the law, and tabulated below. To meet the requirements of this work a special laboratory building of brick has been erected and maintained.

Extreme accuracy and excellence of work are considered of more importance than pecuniary profits. All assays are made in duplicate and if not accordant are repeated. The work of the Bureau is under the personal direction of the professor of metallurgy and a paid assistant, and the assays are not made by students, who receive their instruction in the regular laboratories of the University.

The money received for assaying is deposited monthly to the credit of the assay fund which is used to pay the assayer and the cost of material and apparatus.

## RATES FOR ASSAYING AND CHEMICAL DETERMINATIONS.

### COMMON ASSAYS AND CHEMICAL DETERMINATIONS.

One element only:

|                                                                 |        |
|-----------------------------------------------------------------|--------|
| Gold, or silver, or copper, or lead, or iron, or insoluble..... | \$1.00 |
| Zinc, or calcium, or magnesium, or sulphur, or manganese.....   | 1.50   |
| Silicon or chlorine.....                                        | 2.00   |

Combinations:

|                                                |      |
|------------------------------------------------|------|
| Gold and silver.....                           | 1.00 |
| Copper and iron, or lead and iron.....         | 1.50 |
| Insoluble, copper, and lead.....               | 2.00 |
| Insoluble, copper, and iron.....               | 2.00 |
| Insoluble, lead and iron.....                  | 2.00 |
| Insoluble, zinc, and iron.....                 | 2.50 |
| Insoluble, lead, copper, and iron.....         | 2.50 |
| Gold, silver, copper, and lead.....            | 2.50 |
| Gold, silver, copper, iron, and insoluble..... | 2.50 |

### SPECIAL CHEMICAL DETERMINATIONS.

One element only:

|                                                                                                                           |      |
|---------------------------------------------------------------------------------------------------------------------------|------|
| Aluminum, or tungsten, or barium, or chromium                                                                             | 3.00 |
| Cadmium, or tin, or arsenic, or bismuth or antimony, or titanium, or sodium, or potassium, or uranium, or phosphorus..... | 4.00 |
| Nickel, or cobalt, or molybdenum, or vanadium                                                                             | 5.00 |

**CHEMICAL ANALYSIS.**

|                                                                                               |       |
|-----------------------------------------------------------------------------------------------|-------|
| Coal and coke analysis, giving moisture, volatile combustible matter, fixed carbon and ash... | 5.00  |
| The same, including determination of sulphur and phosphorus.....                              | 7.50  |
| Silicate analysis.....                                                                        | 15.00 |
| Cement analysis (chemical).....                                                               | 15.00 |
| Cement analysis (mechanical).....                                                             | 2.50  |
| Cement tests (strength and soundness, by the Department of Civil Engineering).....            | 3.00  |
| Boiler water analysis.....                                                                    | 10.00 |

**RATES FOR TESTING ORES.**

Stamp Mill Amalgamation, including sampling, assays, retorting, etc.:

|                                                            |         |
|------------------------------------------------------------|---------|
| For lots of one ton or thereabouts.....                    | \$30.00 |
| The same, with concentration of pulp on Wilfley table..... | 30.00   |
| For lots of two tons, without concentration....            | 40.00   |
| For lots of two tons, with concentration.....              | 45.00   |

Smaller Amalgamation Tests, including all sampling charges, and concentration after amalgamation:

|                                                 |         |
|-------------------------------------------------|---------|
| For small samples up to five pounds.....        | \$ 7.00 |
| For small samples, five to twenty-five pounds.. | 10.00   |
| For small samples, twenty to one hundred pounds | 15.00   |

In these smaller tests, the sample is ground to pass a suitable mesh, and is agitated with mercury. The mercury is panned out, retorted, and the values determined in bullion. The values in the concentrates and tailings are also determined. The number of tests nec-

essary to determine the adaptability of any ore to treatment in cyaniding varies so greatly that no general rates can be offered.

#### CONSIGNMENTS, REMITTANCES, ETC.

Samples, ores, and other consignments should be shipped to the University of Arizona, the School of Mines, Tucson, Arizona. Small quantities may best be sent by mail, at the rate of one cent per ounce; larger quantities by express or by freight. The Wells Fargo Express Company makes daily deliveries at the University.

All assays, chemical determinations and chemical analyses, except gratuitous qualitative tests mentioned elsewhere, must be paid for in advance.

No determination of any kind will be made until the required payment arrives. Remittances should be made by postoffice money order, Wells Fargo money order, bank draft, or check on a Tucson bank, payable to K. C. Babcock, President, University of Arizona, to whom also business communications relating to matters discussed in this circular should be addressed.

## AGRICULTURAL EXPERIMENT STATION.

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### OFFICERS.

KENDRIC C. BABCOCK, Ph. D., President of the University.  
ROBERT H. FORBES, M. S., Director and Chemist.  
JOHN J. THORNBURGH, A. M., Botanist.  
ALBERT E. VINSON, Ph. D., Biochemist.  
FREDERICK W. WILSON, B. S., Animal Husbandman.  
G. E. P. SMITH, C. E., Irrigation Engineer.  
WILLIAM B. MCCALLUM, Ph. D., Associate Botanist.  
J. ELIOT COIT, Ph. D., Horticulturist.  
WILLIAM H. ROSS, Ph. D., Assistant Chemist.  
ROBERT W. CLOTHIER, M. S., Agriculturist.  
FRANK C. KELTON, B. S., Assistant Engineer.  
T. D. A. COCKRELL, Consulting Entomologist.  
WILBUR O. HAYES, Secretary.

### ORGANIZATION AND WORK.

The Agricultural Experiment Station is a legally constituted department of the University, whose purpose is to "aid in acquiring and diffusing \* \* \* useful and practical information on subjects connected with agriculture, and to promote scientific investigation and experiment respecting the principles and applications of agricultural science."

With the above objects in view, the organization of the station includes the departments of administration

agriculture, horticulture, animal husbandry, botany, plant physiology and pathology, chemistry, and irrigation investigations, the whole or a major portion of the time of one or more members of the station staff being devoted to each department of the station work. Provision is made for meterological work also, though to a less degree.

Owing to the wide variation in agricultural conditions in Arizona, it has been found of advantage to distribute the work so that each department is located, so far as possible, in that region most favorable to the accomplishment of its own special results. According to this principle, the various lines of Experiment Station work have been distributed as follows:

The Director's office and the departments of botany, plant physiology and pathology, chemistry, and irrigation investigations are maintained at Tucson in the University buildings. Through this arrangement the Experiment Station profits by the buildings and libraries of the University, while the University is benefitted from time to time by the teaching ability of members of the Station staff. It has been found that from this base of operations the three great agricultural districts of the Territory—Salt River Valley, the lower Colorado, and the upper Gila—are accessible with equal convenience for field work and observations.

On the same ground—fitness of location for the work undertaken—the Experiment Station Farm has been maintained and strengthened at Phoenix. Salt

River valley is intermediate in elevation, in situation, and in mean yearly temperature between the other two important farming districts above mentioned, and for this reason the agricultural and horticultural results obtained there are capable of the most general application in the Territory at large.

On the same principle again, the date palm orchard, conducted in co-operation with the United States Department of Agriculture, is located in the alkaline district south of Tempe, where a successful demonstration of this palm as a commercial fruit producer will be of the greatest value, creating use for great areas of alkaline land in the arid southwest.

The demonstration farm near Yuma, in the fertile Colorado Valley bottom, has likewise afforded a succession of object lessons to the public of that locality, as well as much needed information concerning crops, agricultural methods and markets for that rich region.

The range station also, for the study of worn-out range country with a view to its reclamation to usefulness, is located in a typical district near Tucson, and is conducted under the auspices of the department of botany, co-operating with the United States Department of Agriculture.

A dry-farm has recently been put in operation in the Sulphur Springs Valley, between Willcox and Douglas, in a locality typical of large areas.

The results of the Experiment Station work are made public at frequent intervals in the bulletins and re-

ports of the Station. These publications are made in two series: First, the longer and more technical bulletins, stating in considerable detail the investigations as they mature; and, secondly, the Timely Hints for Farmers, which are brief writings issued at the time when they will be most useful, written in plain language, and presented in popular form.

Along its several general lines of effort the Station during the ten years ending with 1908 has issued 99 publications, exclusive of annual reports which contain much technical information of similar character. These publications may be classified as follows:

|                                                 |    |
|-------------------------------------------------|----|
| Soils, waters, alkali, and farm management..... | 21 |
| Climate.....                                    | 1  |
| Crops.....                                      | 35 |
| Weeds, insect pests and plant diseases.....     | 15 |
| Irrigation.....                                 | 10 |
| Animal industry and the range.....              | 17 |

When it is remembered that for years past the mailing list has enabled us to reach from forty to fifty per cent of the farming population of the Territory, it is not surprising that the effects of Station work are now generally in evidence, more particularly in our irrigated southern valleys.

Continuing with former appropriations the Twenty-Fifth Territorial Legislature set aside \$13,100 for the use of the Experiment Station for the bienium ending in 1911. This appropriation provides for printing, for Farmers' Institues, for dry-farming experiments, for

the maintenance of the date orchard at Tempe and the demonstration farm at Yuma. Supplementing the Federal funds therefore, provision is made for the symmetrical development of this work in the Territory, both experimentally and educationally; and, prospectively, "the farmers' college" bids fair to increase in usefulness to the growing agricultural interests of the Territory.

## PREPARATORY DEPARTMENT.

### FACULTY.

KENDRIC CHARLES BABCOCK, Ph. D., President.

HENRY A. E. CHANDLER, B. S., Principal.

CHARLES ALFRED TURRELL, A. M., French, German, Spanish.

WILLIAM WHEELER HENLEY, A. B., Shopwork and Drawing.

ANDREW ELLICOTT DOUGLAS, D. Sc., Science.

CAPT. HIRAM M. POWELL, Military Science and Tactics.

WILLIAM GEORGE MEDCRAFT, A. M., Mathematics.

RAYMOND C. BENNER, M. S., Chemistry.

HENRY A. E. CHANDLER, B. S., History and Civics.

LEVONA PAYNE NEWSOM, Ph. D., Latin and Greek.

FRANK LEWIS KLEEGER, B. S., Physical Training and Mathematics.

FREDERICK E. TALMAGE, B. L., Bookkeeping, Stenography, Typewriting.

\*OPAL I. TILLMAN, B. S., Domestic Science and Botany.

IDA C. REID, Ph. B., Mathematics and History.

HELEN JANE ALDRICH, M. A., Spanish and French.

CAROLINE BATES SINGLETON, A. B., English.

ETHELBERT W. WALDRON, A. B., English.

WILLIAM ARTHUR TARR, B. S., Drawing.

ELIZABETH ELLINWOOD ROBERTS, A. B., German.

MABEL A. GUILD, Latin.

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\*Resigned, March, 1909.

### GENERAL INFORMATION.

In this department the University offers the work of a well-organized, four-years high school, with the added advantages of shopwork and drawing, and military drill. The general library and gymnasium are open to all students in this department.

The equipment of the scientific laboratories is available for use in this preparatory work, whenever it can be used advantageously, and makes possible strong work in elementary science. The instructors in this department are assisted by the professors of the college departments, several of whom regularly conduct preparatory classes. By reference to the course of study which follows, it will be seen that it offers a comprehensive training for those who may not be able to pursue their studies farther, while it gives a good preparation for college.

### ADMISSION.

Admission to regular standing in the first year of the preparatory course presupposes the completion of the work of the eighth grade of the public or parochial schools. Students who do not bring certificates showing the completion of this work, must take examinations to test their ability to pursue profitably the work of the first year. Pupils who have not completed the work of the ninth grade (or the first year of a high school) will not be admitted into the University from cities in Arizona having more than 5,000 population.

All students entering the preparatory department will be required to take an examination in oral reading. To remedy notable deficiency in this subject, the University will require extra work in addition to other studies. In all cases in which the preparation of a student in a particular subject proves to be deficient, the University reserves the right to require the student to secure at his own expense the help of an approved coach until the deficiency is remedied.

#### LIVING ACCOMODATIONS AND EXPENSES.

One dormitory, South Hall, is set apart for the use of male preparatory students; details of furnishings, living expenses, etc., are set forth in a paragraph earlier in this Register. These expenses are substantially the same for both college and preparatory students, save that laboratory fees and book bills are higher for the former. The expenses necessarily incurred during the academic year are about \$250, but of this amount nearly one-third falls due in the first month, or in the six weeks before Novemebr 1st, in the form of charges which are made but once during the year or but once during the stay of the student in the University. The following are the ordinary expenses for the first month:

|                                                                                              |         |
|----------------------------------------------------------------------------------------------|---------|
| Matriculation.....                                                                           | \$ 5.00 |
| Dormitory deposit—Maintenance fee.....                                                       | 3.00    |
| Mattress, blankets, pillows, sheets, etc., (unless<br>brought from home by the student)..... | 15.00   |
| Board for the first month, including napkin fee.                                             | 17.50   |
| Books.....                                                                                   | 6.00    |

|                           |       |
|---------------------------|-------|
| Shop and Drawing fee..... | 5.00  |
| Military uniform.....     | 16.25 |

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\$67.75

The dormitory is placed in charge of two resident instructors, assisted by a committee of students. Inspection of rooms is made in the morning and in the evening by the head of the dormitory. The hours from seven to quarter past nine in the evening are observed as study hours except on Fridays and Sundays. Students under twenty-one years of age are required, unless relieved by the President, to obtain permission to leave the Campus, or to leave the dormitory during study hours, except on Sundays from nine to twelve A. M., Wednesdays, four to seven P. M., and Fridays, four to six P. M. Breaches of the regulations of the dormitory are punished by "extra study"—labor about the buildings or grounds—by confinement to rooms, or by expulsion from the dormitory; for damage to University property, a money penalty is imposed.

#### COURSE OF STUDY.

The following course of study will be required of all students who fit themselves at the University for entrance to the Freshman class in 1910. Such variations from it will be permitted as will adapt it to the case of students who took part of their work in other schools.

Military drill is required of all able-bodied male students throughout the course. Physical training is required of all students, unless they are excused by the

President upon presenting a certificate from one of the University physicians. The young men have drill three times per week and exercise in the gymnasium twice. The young women have physical culture three times a week.

The language begun in the second or third year must be pursued for at least two years in order to secure credit towards graduation.

Though the subjects are for convenience grouped by years in the following schedule, the departmental method is followed. In the description of courses, the subjects are arranged by groups or departments in the consecutive order in which they are taken up and students will be required to take them in this order. Aside from this sequence the ability of each student must determine what subjects will be pursued at any given time, due regard being given to the proper balance of subjects. The wishes of parents will always be given careful consideration in making up the schedule of work for each student, but the final decision in the matter rests with the committee on registration, which is composed of persons who have had long experience in secondary and collegiate teaching. Individual attention will be given to the needs of each student.

To each student who completes the studies of this course, receiving a total of sixteen units (a unit representing a subject pursued for one year with five, or four, recitation periods per week), a certificate stating that fact will be given, entitling the holder to admission to

the corresponding University courses of instruction without examination.

Subjects thus marked \* are elective. Five hours of elective must be chosen in the second year. In the third and in the fourth year, electives making up at least nine hours must be chosen. The figures indicate exercises per week.

#### FIRST YEAR.

|                              |   |                        |   |
|------------------------------|---|------------------------|---|
| English.....                 | 5 | Drawing and shop work, |   |
| Algebra.....                 | 5 | or Agriculture.....    | 5 |
| Greek and Roman History..... | 3 |                        |   |
| Physical Geography.....      | 3 |                        |   |

#### SECOND YEAR.

|                       |   |                           |   |
|-----------------------|---|---------------------------|---|
| English.....          | 5 | *Latin (first year).....  | 5 |
| Algebra.....          | 5 | *German (first year)....  | 5 |
| European History..... | 5 | *French (first year)....  | 5 |
| *Botany.....          | 5 | *Spanish (first year).... | 5 |
| *Agriculture.....     | 5 | *Drawing and shop work    | 5 |
| *Bookkeeping.....     | 5 |                           |   |

#### THIRD YEAR.

|                          |   |                           |   |
|--------------------------|---|---------------------------|---|
| English.....             | 5 | *French (second year)...  | 5 |
| Plane Geometry.....      | 5 | *German (first year)....  | 5 |
| *Chemistry.....          | 5 | *German (second year)...  | 5 |
| *Latin (second year).... | 5 | *Spanish (first year).... | 5 |
| *Greek (first year)..... | 5 | *Spanish (second year)... | 5 |
| *French (first year).... | 5 | *Stenography.....         | 5 |

## FOURTH YEAR.

|                              |   |                          |   |
|------------------------------|---|--------------------------|---|
| English .....                | 5 | *Latin (third year)..... | 4 |
| American History and Civics  | 5 | *Greek (second year)...  | 5 |
| *Solid Geometry (first half) | 4 | *French (second year)... | 5 |
| *Trigonometry(second half)   | 5 | *German (second year).   | 5 |
| *Physics .....               | 5 | *Spanish (second year).  | 5 |

## ENGLISH.

The English of the preparatory course is based upon what is known as the entrance requirements of New England colleges. The work is in general divided into three parts: classics, studied in class; composition and grammar work done partly in class and partly outside; and supplementary reading done largely outside the class room. All these parts of the work may be carried on at the same time, as the circumstances of the class seem to require, the classics and supplementary reading forming the basis of a large part of the work in grammar and composition. Throughout the course, however, a primary aim is to develop the student's individual power of expressing himself in words. The time allotted to these three phases of English varies from year to year, increasing attention being paid to the appreciative and critical faculty as the course advances. In the fourth year a brief outlining history of English literature occupies about one-half of the year's work in English.

Five hours each week throughout the course are given to English. According to the following general outline, selections from the list below are made at the discretion of the teacher, preference being given to the New England College Entrance Requirements, which are marked by an asterisk.\*

#### FIRST YEAR.

ENGLISH GRAMMAR AND COMPOSITION receive one-half of the time of the first year. Maxwell's *Advanced Lessons in English Grammar* is used as a text-book.

CLASSICS. Shakespeare's \**Merchant of Venice*, Scott's *Marmion*, Irving's \**Sketchbook*, Longfellow's *Hiawatha*, Franklin's *Autobiography*, Burrough's *Sharp Eyes*.

SUPPLEMENATRY READING. Longfellow's *Evangeline*, Scott's \**Ivanhoe* and *The Talisman*, Cooper's *Last of the Mohicans*, Hale's *Man Without a Country*, Mark Twain's *Tom Sawyer*, Jack London's *Call of the Wild*, Well's *War of the Worlds*.

#### SECOND YEAR.

COMPOSITION AND GRAMMAR. As in the first year, with attention to figures of speech, reproducing the work of classic authors, elementary etymology, exercises in composition, narration, and description.

CLASSICS. Coleridge's \**Ancient Mariner*; Poe's \**Poems and Tales*; Hawthorne's \**House of the Seven Gables*; Tennyson's \**Idylls of the King*; Lowell's \**Vision of Sir Launfal*; George Eliot's \**Silas Marner*.

SUPPLEMENTARY READING. Scott's *Lady of the Lake*; Blackmore's *Lorna Doone*; Irving's \**Alhambra*;

Kingsley's *Westward Ho*; Dicken's *Oliver Twist*; Bret Harte's *Luck of Roaring Camp*; Stevenson's *Treasure Island*.

## THIRD YEAR.

COMPOSITION AND RHETORIC. Continued, with emphasis on elementary exposition and argumentation. Herrick and Damon's *Composition and Rhetoric* is used as a text-book.

CLASSICS. Shakespeare's *\*Julius Cæsar* and *Midsummer Night's Dream*; *\*Sir Roger de Coverley Papers*; Macaulay's *Essays on Addison* and *\*Johnson*; Goldsmith's *Vicar of Wakefield*; Carlyle's *\*Essay on Burns*; the Poems of Burns; Burke's *\*Speech on Conciliation*.

SUPPLEMENTARY READING. Moore's *Lalla Rookh*; Irving's *Life of Goldsmith*; Austen's *Pride and Prejudice*; Dicken's *Tale of Two Cities*; George Eliot's *Mill on the Floss*; Barrie's *Sentimental Tommy*.

## FOURTH YEAR.

COMPOSITION AND GRAMMAR. Exercises in narration and description for flexibility and ease of expression and general preparation for college entrance requirements

HISTORY OF ENGLISH LITERATURE. Study of Moody and Lovett's *First View of English Literature*, as a text-book, and reading of the following masterpieces: Chaucer's *\*Prologue to the Canterbury Tales*; Shakespeare's *\*Macbeth* and *\*Henry V.*; the shorter poems of *\*Milton*, Wordsworth, *\*Byron*, Shelley, Keats, Tennyson, and *\*Browning*; Scott's *Pirate*; Dicken's *David Copperfield*; George Eliot's *Adam Bede*.

**MATHEMATICS.**

**ALGEBRA.** First year: introduction, factoring, fractions, simple equations. simultaneous equations, and special problems. Second year: involution, evolution, theory of exponents, radicals, quadratic equations, and proportion. The ground covered by these two years will be required for entrance to the engineering courses in college.

**PLANE GEOMETRY.** Third year: emphasis is laid on thorough work in original exercises.

**SOLID GEOMETRY.** First semester, fourth year, with original exercises.

**PLANE AND SPHERICAL TRIGONOMETRY.** Second semester, fourth year.

**MECHANIC ARTS.**

This work consists of both drawing and shop work, between which subjects the student's time is about equally divided. The course covers two years and is designed to furnish a thorough elementary knowledge of manual training as taught in the secondary schools of the country.

**DRAWING.** First year: Freehand sketching in perspective and orthographic projection. Reinhart's lettering, freehand working drawings. Second year: Mechanical Drawing and geometrical problems.

**SHOP WORK.** First year: "Sloyd," care and use of woodworking tools. Second year: Forging, joinery, wood-turning.

**SCIENCE.**

It is the object of the courses in science to initiate the student into the processes and methods used in laboratory work; to teach close observation, careful manipulation and logical deduction; to acquaint the student with the fundamental facts of the various branches of science and to give full practice in the use of good English in describing various observations and experiments. To insure better results in the notebooks, they will all be passed upon by one of the instructors in English.

**BOTANY.**

A year's work is offered in beginning botany, being largely with living plants. Simple and compound microscopes are provided, and students are required to keep careful notes on laboratory work and experiments. The work is supplemented with lectures and a text-book.

**PHYSICAL GEOGRAPHY.**

This course, combining the laboratory method with the text-book, aims to give the pupils training in exact observation of familiar phenomena, like distance, weight, pressure of liquids and gases, temperature, winds, clouds and the habits of plants and animals. The natural forces producing erosion, formation of soil, and rocks, the processes of nature as seen in seed germination and plant growth (with demonstrations with the microscope) will be discussed, with frequent experiments and field excursions. The entire country within the reach of the University is a great natural laboratory, full of interest and information for all. The course explains these

features which become so familiar to everyone residing here.

#### CHEMISTRY.

A year's work with the text and in the laboratory, in such proportions as the instructor decides upon. Each student must keep a notebook in which he describes the process and results of his laboratory work.

#### PHYSICS.

The course aims to show that physics is not something abstract or mysterious, but is the simple explanation of everyday occurrences not usually understood and often unnoticed. It consists of three recitation periods and four laboratory periods per week, carried on along the lines laid down for the senior year in secondary schools. Each student must keep a notebook in which a minimum number of experiments must be written up.

#### HISTORY.

The aim of the work in history is to lead the pupil to see the development of races and nations along political, social and religious lines, and to arouse in him a love for the subject and a habit of broad and discriminating reading.

The work of the first year consists of a survey of the development and characteristics of the Greek and Roman civilizations. A text such as Wolfson's *Essentials of Ancient History*, or West's *Ancient History*, will be supplemented by collateral reading and a notebook.

The work of the second year includes mediaeval and modern history. The aim is to give the student an idea

of the essential unity of history and the leading facts in the political development of races and nations. Harding's *Essentials of Mediaeval and Modern History*, is used, supplemented by the reading of references.

Hart's *Actual Government* is the textbook in civics. The historical development of the subject is made prominent, while practical problems, such as taxation and municipal government, are made the subjects of special investigation and study. The text in history will be Channing's *Students' History of the United States*.

#### **LATIN, GREEK, FRENCH, GERMAN AND SPANISH.**

For an outline of the courses in Latin and Greek see page 48, under requirements for admission.

For an outline of the courses in French, Spanish and German, see pages 80, 104, 84.

#### **BOOKKEEPING AND COMMERCIAL PRACTICE.**

Bookkeeping is taught by the modern budget system. The work is individual and each student may progress as fast as his time and ability permit. The course is thorough in all the details of office practice. Students are made familiar with different filing cabinets, the filing of letters, the use of card ledgers, the copying and indexing of letters and bills in copy books. The course includes instruction in commercial law, with special emphasis laid on the ordinary forms of commercial paper and the different endorsements. The department is equipped with the latest vertical files, cabinets, letter press and office sundries. All students in

bookkeeping are required to take some other branch of mathematics and must show proficiency in English.

#### STENOGRAPHY AND TYPEWRITING.

A complete course in stenography is offered. The Gallagher-Marsh system, a system which has received the highest endorsement of leading court reporters on the Pacific Coast, and which has been adopted by the Boards of Education in the largest cities of California, has recently been adopted. The amount of time allotted for this work has also been increased from five hours to eight hours per week. The object of the course is to train students so that they may become practical stenographers. With this end in view particular stress is laid upon neatness, filing, copying and indexing. This branch of the commercial department is equipped with up-to-date filing cases, office sundries, and six typewriters, four of which are Remingtons, one an Oliver, and one the L. C. Smith Visible. Five of the typewriters are new. *Students taking this work are required to have had one year of high school English, and to take English with this course.*

## ALUMNI REGISTER.

The Alumni Association of the University of Arizona organized on the second day of June, 1897, represents the body of graduates of the University; its object, as expressed in its constitution, is "To promote the interests of the University, to secure unity among its graduates and to foster an attachment to our Alma Mater."

1895.

\*Charles Oma Rouse, B. S.

Mercedes Anna Shibell, B. S., (Mrs. A. J. Gould), Tucson.

Mary Flint Walker, B. S., (Mrs. Pearl Adams), Benson.

1897.

Edward Marshall Boggs, C. E., (nunc pro tunc), Chief Engineer Oakland Electric Railways, Oakland, California.

Clara Cramond Fish, B. S., (Mrs. F. C. Roberts), Mammoth.

George Ojeda Hilzinger, B. S., Attorney, Tucson.

Mark Walker, B. S., Metallurgist, Los Angeles, California.

1898.

Hattie Ferrin, B. S., (Mrs. Charles Solomon). Safford.

Granville Malcolm Gillett, B. S., Draughtsman in Surveyor General's Office, Phoenix.

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\*Died, 1906.

Minnie Watts, B. S., (Mrs. W. B. Smith), Altaville, California.

\*John Desha Young, B. S.

1899.

Robert L. Morton, B. S., Assayer, Yuma.

1900.

Ida Clarissa Flood, B. S., (Mrs. G. Dodge), Oakland, California.

Samuel Pressly McCrea, B. S., A. B., Principal of High School, Redwood City, California.

Charles Pierce Richmond, B. S., Mining Engineer, Phoenix.

Florence Russell Welles, B. S., (Mrs. Wm. Angus), Los Angeles, California.

1901.

Rudolph Castaneda, B. S., Engineer, Nacozari, Sonora, Mexico.

Clara Ferrin, B. S., Teacher, Tucson.

George Millard Parker, B. S., Denver, Colorado.

David Hull Holmes, B. S., (nunc pro tunc), Architect, Tucson.

1902.

Andrew Gilbert Aiken, A. B., B. S., Surveyor, Canton, New York.

Moses Blumenkranz, B. S., Assistant Superintendent Shannon Copper Company, Metcalf.

Ruth Brown, Ph. B., (Mrs. Wilkins Manning), Tucson.

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\*Died, 1899.

Felix Grundy Haynes, B. S., Casa Grande.

Rose Belle Parrott, Ph. B., Teacher, Roseburg, Oregon.

Philip Matthew Reilly, B. S., Mining Superintendent Cumpas, Sonora, Mexico.

Bertram L. Smith, B. S., Assayer, Silver Bell.

Bessie Smith, Ph. B., (Mrs. Earle Davis), Douglas.

Walter James Wakefield, Cashier, B. S., Tucson.

1903.

Advanced Degrees:

LL. D., Hon. William Herring, Tucson.

M A., John William Gorby, (B. A., Marietta), Chicago, Illinois.

M. A., Benjamin Franklin Stacey, (B. A., B. D., Lombard), Teacher, Pasadena, California.

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Richard Lamar Drane, B. S., Asst. Chief Engineer Randolph Lines, Tucson.

George Mark Evans, (LL. B., Michigan), Ph. B., Teacher, Santa Ana, California.

Leslie Alexander Gillett, B. S., (Mining), Draughtsman, Surveyor General's Office, Phoenix.

Georgia Ann Holmesley, Ph. B., Teacher, Clifton.

Edward Horton Jones, B. S., Assayer, Denver, Colorado.

John Williard Prout, Jr., B. S., General Manager Santa Cruz M. and S. Co., Mowry.

Thomas Edward Steele, B. S., Assayer, Sasco.

1904.

William Burnham Alexander, B. S., Civil Engineer, Tucson.

Elbert John Hollingshead [Kimble], B. S., Clerk, Seattle, Washington.

Frank Caleb Kelton, B. S., Assistant Engineer, University of Arizona, Tucson.

Estella Markham Prout, Ph. B., Teacher, Mowry.

John Willard Prout, Jr., B. S. (Mining), See 1903.

1905.

\*Ora Elinor Norway, Ph. B.

1906.

Advanced Degree:

M. S., William B. Begg, (A. B., Toronto).

Chester Bennett Clegg, B. S., (Civil Engineering).

John Wesley Gebb, B. S. (Mining), Dawson, Alaska.

Roy Bartley Kilgore, B. S. (Mining), Seattle, Washington.

Roy Gibbons Mead, B. S. (Mining), Mine Superintendent, Camptonville, California.

Roy Webb Moore, B. S. (Mining), Kelvin.

Carobel Murphey, (A. B., Cox College), Ph. B., Teacher, Tucson.

Ida Christina Reid, Ph. B., Instructor, University of Arizona, Tucson.

Minnie Louise Wooddell, Ph. B., Teacher, Tucson.

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\*Died, 1908.

1907.

Advanced Degree:

Engineer of Mines, John Willard Prout, B. S., B. S.  
(Mining). See 1903.

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Charles Alexander, Ph. B., Tempe.

Harriet Estella Brown, Ph. B., Teacher, Tucson.

Lawrence Brodhead Croasdale, B. S. (Mechanical  
Engineering), Draughtsman, Delaware Water Gap, Pa.

Weda Ina Purcell, Ph. B., Teacher, Tucson.

Hugh Maupin Wolflin, B. S., U. S. Testing Engineer,  
Pittsburg, Pa.

1908.

Honorary Degree:

LL. D., William Phipps Blake, Sc. D., Tucson.

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Carroll Pitkin Bradstreet, B. S., Pachuca, Mexico.

Benjamin Scott Dinsmore, B. S., Kennecott, Alaska.

William Arthur Tarr, B. S. (Mech. Eng.) Oklahoma  
(Agricultural), B. S. (Mining), Instructor, University of  
Arizona, Tucson.

Hugh Maupin Wolflin, B.S., B.S. (Mining). See 1907

Leigh Ernest Worthing, B. S., Traver, Michigan.

# MILITARY ORGANIZATION.

APRIL 1, 1909.

Commandant of Cadets

CAPTAIN HIRAM McL. POWELL, U. S. A.

Assistant to Commandant.

CAPTAIN WARREN A. GROSSETTA, N. G. A.

|                           |                     |
|---------------------------|---------------------|
| Captain.....              | Rollin Brown        |
| First Lieutenant.....     | Charles A. Firth    |
| Second Lieutenant.....    | Sidney R. Jones     |
| First Sergeant.....       | J. Urbano Salazar   |
| Sergeant (color).....     | John C. McClure     |
| Sergeant (color).....     | George Nishihara    |
| Sergeant.....             | William R. Campbell |
| Sergeant.....             | Clifton H. Rolfe    |
| Corporal.....             | Leo Z. Rick         |
| Corporal.....             | Arthur L. Lovejoy   |
| Corporal.....             | Stadden S. Hart     |
| Corporal.....             | Ralph S. Rigg       |
| Corporal.....             | Ralph W. Harrison   |
| Corporal.....             | Erving A. Johnsor   |
| Corporal (Trumpeter)..... | Carlos Castaneda    |

## REGISTER OF STUDENTS.

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### GRADUATES.

|                                                                     |                   |
|---------------------------------------------------------------------|-------------------|
| Bates, Florence Fisher, A. B. Michigan; A. M. Columbia              | Tucson            |
| Bonillas, Ygnacio Safford, B. S. Mass. Inst. Tech., Nogales, Sonora |                   |
| Carpenter, Miles Miller, B. S. Texas (Agric.)                       | Tucson            |
| Comstock, Elizabeth M., A. B. Indiana                               | Richmond, Indiana |
| Kleeberger, Frank Lewis, B. S. California                           | Tucson            |
| Maynard, Arthur Bennett, A. B. Hamilton                             | Fundicion, Sonora |
| Reid, Ida Christina, Ph. B. Arizona                                 | Tucson            |
| Singleton, Caroline Bates, A. B. Wellesley                          | Tucson            |
| Schurtz, Vera Zoe, A. B. Michigan                                   | Tucson            |
| Tarr, William Arthur, B. S. Oklahoma (Agric.), B. S. (Mining)       |                   |
| Arizona                                                             | Tucson            |

### SENIORS.

|                         |                            |
|-------------------------|----------------------------|
| Hatcher, Burrell R.     | Douglas                    |
| Hooper, Ethel Amis      | Berkeley, California       |
| La Baree, Grace Ysabel  | Tucson                     |
| Post, Anita Calneh      | Tucson                     |
| Ruthrauff, John Mosheim | Tucson                     |
| Thompson, Arthur Perry  | Phoenix                    |
| Wilkerson, Mabel        | San Bernardino, California |

### JUNIORS.

|                            |                         |
|----------------------------|-------------------------|
| Behr, Ernest Edward        | Pasadena, California    |
| Blades, Ernest Orrin       | Roosevelt               |
| Burnham, Roderick Deane    | Pasadena, California    |
| Calloway, Lawrence Arthur  | Tucson                  |
| Disney, Lester             | Lawrence, Kansas        |
| Doan, Fletcher Morris, Jr. | Tombstone               |
| Douglass, Ida Whittington  | Tucson                  |
| Grossetta, Warren Arthur   | Tucson                  |
| Hoyt, Joseph Clyde         | Jerome                  |
| Rebstock, Duane            | Los Angeles, California |

## SOPHOMORES.

|                                        |                         |
|----------------------------------------|-------------------------|
| Adams, Leland Drew .....               | Oakland, California     |
| Andrus, Dexter Eli .....               | Rockford, Illinois      |
| Elliott, Ruth (special) .....          | Clifton                 |
| Farish, Thomas Edward (special) .....  | Phoenix                 |
| Foster, George S., Jr. (special) ..... | Tucson                  |
| Harriman, William Ruddy .....          | Los Angeles, California |
| Harrison, Ralph Waldo .....            | Ashland, Wisconsin      |
| Kitt, Katherine F. ....                | Tucson                  |
| Millar, Leslie Creighton .....         | Tucson                  |
| Murphey, Elizabeth Ella .....          | Tucson                  |
| Plunkett, Ralph Elbert (special) ..... | Little Rock, Arkansas   |
| Purcell, Ivy Mae .....                 | Tucson                  |
| Rider, Jane Herbst .....               | Tucson                  |
| Rose, Frank Winfred .....              | Livingston              |
| Steele, Willard Penn .....             | Marshfield, Ohio        |
| Strong, Leon Henri .....               | Tucson                  |
| Tarr, Carolynn .....                   | Tucson                  |

## FRESHMEN.

|                                 |                      |
|---------------------------------|----------------------|
| Bayard, Helen .....             | St. Paul, Minnesota  |
| Beck, Charlotte Ellen .....     | Tucson               |
| Bennie, Florence Mary .....     | Clifton              |
| Bone, James Lee .....           | Phoenix              |
| Brown, Rollin .....             | Tucson               |
| Coles, Henry Oliver .....       | Bisbee               |
| Durley, Earle Preston .....     | Bisbee               |
| Elliott, Gordon .....           | Clifton              |
| Estill, Howard Wilmot .....     | Tucson               |
| Firth, Charles Abraham .....    | Aravaipa             |
| Johnston, Clifford F. ....      | Tempe                |
| Lusk, Harry Wilton .....        | Decatur, Michigan    |
| McDermott, Ora Martina .....    | Tucson               |
| McNeil, Clara May .....         | Tucson               |
| Maverick, Philip Augustus ..... | San Antonio, Texas   |
| Mitten, James Ralph .....       | Worthington, Indiana |

|                                |                          |
|--------------------------------|--------------------------|
| Nishihara, George.....         | Tucson                   |
| Purcell, Marie Ella.....       | Tucson                   |
| Rice, Thomas Briggs.....       | Douglas                  |
| Rick, Leo Zeno.....            | Tucson                   |
| Roberson, George B.....        | Santa Monica, California |
| Sine, Janet Volume.....        | Tucson                   |
| Soulé, Madeleine.....          | Tucson                   |
| Whitwell, Sturges Bigelow..... | Tucson                   |
| Wilkey, Leslie Guy.....        | Phoenix                  |
| Williamson, William Ray.....   | Los Angeles, California  |

## UNCLASSSED—COLLEGE.

|                                                         |                           |
|---------------------------------------------------------|---------------------------|
| Bates, Frances Barton—Spanish, French .....             | Chicago, Illinois         |
| Bogan, Phoebe—Philosophy, English, Astronomy .....      | Tucson                    |
| Brown, Clara Agnes—Spanish, Economics, Stenography..    | Tucson                    |
| Cassiday, Clifford Harry—English .....                  | Tucson                    |
| Corbett, Gulie—Spanish, English .....                   | Tucson                    |
| De Wolf, May Elsie—English, Spanish .....               | Anna, Illinois            |
| Emery, Fannie—Philosophy, Spanish, French .....         | Tucson                    |
| Fish, Florence—Spanish.. ..                             | Tucson                    |
| Goldtree, Estella—English, French, Astronomy .....      | Tucson                    |
| Goodin, Frances Earle—Astronomy.....                    | Tucson                    |
| Hoover, Marie P.—French, English.....                   | Springfield, Ohio         |
| Heney, Ruth—French.....                                 | Tucson                    |
| Hotopp, Clara Marie—English, Spanish..                  | Charlottesville, Virginia |
| Kearns, Theresa Elizabeth—Philosophy, Spanish, English. | Tucson                    |
| Leslie, Beppie Lee—Spanish, English .....               | Tucson                    |
| MacDougal, Louise Fisher—History, English, Philosophy.  | Tucson                    |
| Mead, Cora—Spanish, English .....                       | Tucson                    |
| Merriman, Lurena—French.....                            | Tucson                    |
| O'Connell, Jessie Louise—Spanish, Philosophy .....      | Tucson                    |
| Pease, Ione Gertrude—French .....                       | Tucson                    |
| Trippell, Amy—English, French.....                      | Tucson                    |
| Wallace, Lunah Ward—English, Botany, Philosophy....     | Globe                     |

## SHORT COURSE IN AGRICULTURE.

|                              |                        |
|------------------------------|------------------------|
| Douglas, Clyde.....          | Phoenix                |
| Gardiner, Eugene.....        | Thatcher               |
| LeRoy, Vernon Hitchcock..... | Santa Rosa, California |
| Hite, Courtright.....        | Newark, Ohio           |
| Lee, Robert E.....           | Thatcher               |
| Nichols, Isaac F.....        | Tucson                 |
| St. Claire, Herbert.....     | Phoenix                |
| Tierce, Homer Fleming.....   | Bisbee                 |
| Wooddell, DeLeslie.....      | Tucson                 |

## FOURTH PREPARATORY.

|                             |                         |
|-----------------------------|-------------------------|
| Baker, Mary Agnes.....      | Tucson                  |
| Barnes, Ernest Leo.....     | Humboldt                |
| Bley, Florence Marion.....  | Los Angeles, California |
| Brown, James Lewis.....     | Deming, New Mexico      |
| Brown, Marguerite.....      | Tucson                  |
| Corda, Mamie W.....         | Tucson                  |
| Flanagan, James Joseph..... | Los Angeles, California |
| Jones, Ida L.....           | Tucson                  |
| Jones, Mary Virginia.....   | Tucson                  |
| Jones, Sidney Raymond.....  | Clifton                 |
| Lovejoy, Arthur L.....      | Tucson                  |
| McClure, John C.....        | Tucson                  |
| Morales, Teresa.....        | Tucson                  |
| Smith, Charlotte Ellen..... | Globe                   |
| Wuerdeman, Walter H.....    | Tucson                  |

## THIRD PREPARATORY.

|                              |        |
|------------------------------|--------|
| Baker, Anna Ruth.....        | Tucson |
| Brown, Beryl.....            | Tucson |
| Campbell, William Riggs..... | Tucson |
| Christy, Gerald F.....       | Tucson |
| Clark, Benjamin H.....       | Benson |
| Cook, Carrie H.....          | Tucson |
| Cook, Nina Reese.....        | Tucson |
| Culin, Frank L., Jr.....     | Tucson |

|                            |                    |
|----------------------------|--------------------|
| Grabe, Irene.....          | Tucson             |
| Hawke, Viola M.....        | Tucson             |
| Huddleston, Julian.....    | Tucson             |
| Hofmann, Gladys B.....     | Tucson             |
| Jameson, Belle.....        | Tucson             |
| Johnson, Erving A.....     | Morenci            |
| Kavanaugh, Rose.....       | Tucson             |
| McReynolds, William B..... | Tucson             |
| Millar, Edward B.....      | Tucson             |
| Nichols, Louise W. ....    | Tucson             |
| O'Connell, Mildred.....    | Tucson             |
| Pusch, Wilhelmina.....     | Tucson             |
| Rigg, Ralph.....           | Tucson             |
| Rogers, Frederick W.....   | Tucson             |
| Rolfe, Clifton H.....      | Tucson             |
| Salazar, J. Urbano.....    | Chihuahua, Mexico  |
| Simonds, Marie T.....      | Hermosillo, Mexico |
| Soto, Ernest S.....        | Willcox            |
| Wooddell, Florence.....    | Tucson             |
| Yoder, Paul Allen.....     | Williams           |

## SECOND PREPARATORY.

|                            |                       |
|----------------------------|-----------------------|
| Anderson, Oney.....        | Tucson                |
| Baffert, Filomeno.....     | Tucson                |
| Caruthers, Eugene.....     | Yuma                  |
| Coyle, Francis J.....      | Phoenix               |
| Farrell, Robert E.....     | McCabe                |
| Gaddis, Homer B.....       | Kingman               |
| Greenfield, Walter.....    | Little Rock, Arkansas |
| Harlan, Walter H.....      | Bisbee                |
| Hart, Stadden Stimson..... | Tucson                |
| Henderson, Margaret.....   | Tucson                |
| Hofmeister, Irene.....     | Tucson                |
| Jacobs, Hannah.....        | Tucson                |
| James, Herbert Hanna.....  | Avalon, Pennsylvania  |
| Lindsley, Richard.....     | Tucson                |

|                           |                       |
|---------------------------|-----------------------|
| Loud, Harold L.....       | St. Louis, Missouri   |
| MacDougal, Alice.....     | Tucson                |
| Mack, Francis C.....      | Tucson                |
| Martin, Gladys Sarah..... | Tucson                |
| McFarland, Robert V.....  | Tucson                |
| McKinney, Rufus.....      | Cochise               |
| Murphey, Walter.....      | Tucson                |
| Newland, Joseph.....      | Ardmore, Oklahoma     |
| Powers, Helen R.....      | San Pedro, California |
| Pusch, Maybelle.....      | Tucson                |
| Rea, Helen.....           | Tucson                |
| Richards, David L.....    | Altar, Mexico         |
| Serrano, Albert.....      | Altar, Mexico         |
| Udall, Gladys Madge.....  | Tucson                |
| Wakefield, Edith.....     | Tucson                |
| Willard, Chester.....     | Cornville             |
| Wuerdeman, Emil K.....    | Tucson                |
| Wright, Lyda.....         | Tucson                |

## FIRST PREPARATORY.

|                             |                        |
|-----------------------------|------------------------|
| Bennie, John Willis.....    | Clifton                |
| Bird, Walter Duane.....     | Nogales                |
| Brichta, C. Louis.....      | Tucson                 |
| Cloud, Leo F.....           | Tucson                 |
| Cook, Louis Joseph.....     | Tucson                 |
| Foreshaw, Lea.....          | La Barranca, Mexico.   |
| Grabe, Alice.....           | Tucson                 |
| Hedges, Lawrence S.....     | Chattanooga, Tennessee |
| Heinrichs, L. Marcelle..... | Fort Huachuca          |
| Ming, Marcus A. S.....      | San Carlos             |
| Newning, Oliver Brush.....  | Houston, Texas         |
| Pinelli, Victor.....        | La Colorado, Mexico    |
| Scherrer, Harry A.....      | Dragoon                |
| Shattuck, Eva J.....        | Tucson                 |
| Simonds, Charles F.....     | Hermosillo, Mexico     |

## UNCLASSIFIED PREPARATORY.

|                              |                        |
|------------------------------|------------------------|
| Berger, Samuel Sholes.....   | Vail                   |
| Boyd, Omar E.....            | Tucson                 |
| Burnham, Isabel.....         | Pasadena, California   |
| Cameron, Alice F.....        | Tucson                 |
| Castaneda, Carlos.....       | Benson                 |
| Hedges, James R.....         | Chattanooga, Tennessee |
| McKay, Hazel.....            | Tucson                 |
| Pusch, Henrietta Louise..... | Tucson                 |
| Roletti, Albert Ralph.....   | Tucson                 |
| Spires, Liela M.....         | Tucson                 |

## SUMMARY.

|                                  | Fe-<br>male. | To-<br>male. | tal. |
|----------------------------------|--------------|--------------|------|
| Graduate Students.....           | 5            | 5            | 10   |
| Seniors.....                     | 3            | 4            | 7    |
| Juniors.....                     | 9            | 1            | 10   |
| Sophomores.....                  | 11           | 6            | 17   |
| Freshmen.....                    | 18           | 8            | 26   |
| Unclassified, College.....       | 1            | 21           | 22   |
|                                  | —            | —            | —    |
| Total College.....               | 47           | 45           | 92   |
| Fourth Preparatory.....          | 7            | 8            | 15   |
| Third Preparatory.....           | 14           | 14           | 28   |
| Second Preparatory.....          | 21           | 11           | 32   |
| First Preparatory.....           | 13           | 2            | 15   |
| Unclassified, Preparatory.....   | 5            | 5            | 10   |
|                                  | —            | —            | —    |
| Total Preparatory.....           | 60           | 40           | 100  |
| Short Course in Agriculture..... | 9            | ..           | 9    |
|                                  | —            | —            | —    |
| Total for the University.....    | 116          | 85           | 201  |



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THE UNIVERSITY OF ARIZONA RECORD IS ISSUED FIVE TIMES  
A YEAR, USUALLY IN JANUARY, MARCH, MAY, SEPTEMBER  
AND NOVEMBER.

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ENTERED AS SECOND-CLASS MATTER AT THE POSTOFFICE AT  
TUCSON, ARIZONA, UNDER THE ACT OF JULY 16, 1894.

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THE RECORD INCLUDES THE FOLLOWING PUBLICATIONS:

The Annual Report of the President of the University to  
the Board of Regents.

The Annual Register of the University.

The Announcements of the School of Mines, The Geologi-  
cal Survey, and the Several Departments of Instruction  
and Research

# University of Arizona Record

VOLUME II, NUMBER 3

MAY, 1910

## REGISTER

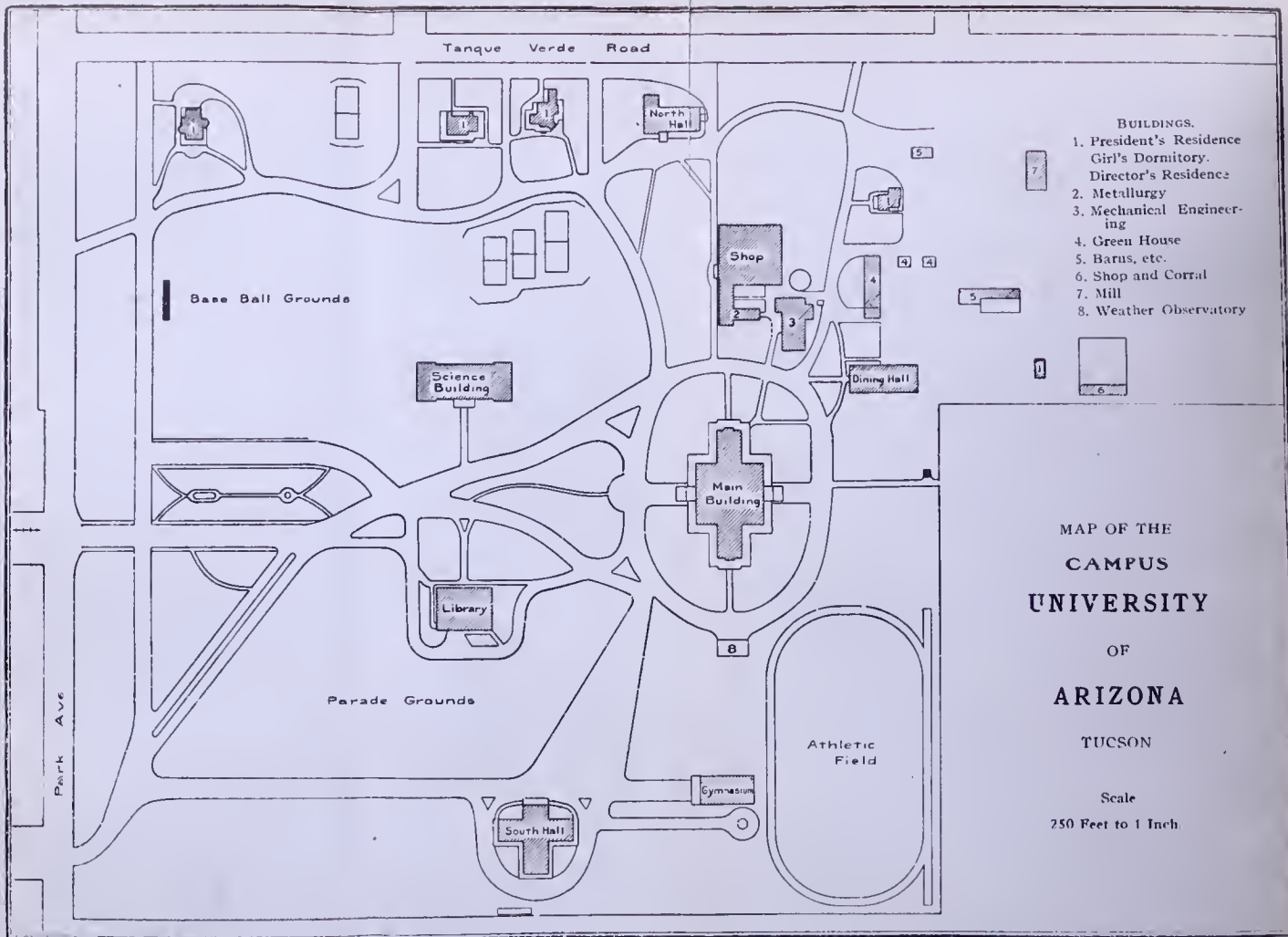
1909-10

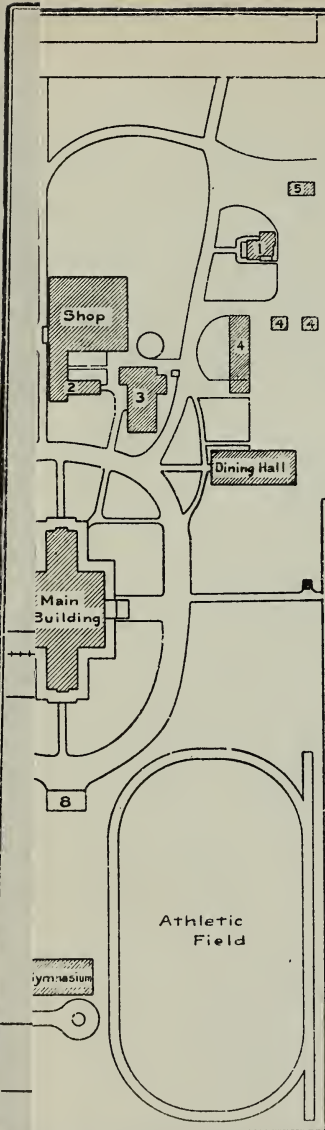
WITH ANNOUNCEMENTS FOR

1910-11

PUBLISHED BY THE  
UNIVERSITY OF ARIZONA  
TUCSON, ARIZONA







#### BUILDINGS.

1. President's Residence
- Girl's Dormitory.
- Director's Residence
2. Metallurgy
3. Mechanical Engineering
4. Green House
5. Barns, etc.
6. Shop and Corral
7. Mill
8. Weather Observatory

## MAP OF THE CAMPUS UNIVERSITY OF ARIZONA

TUCSON

Scale

250 Feet to 1 Inch.

# UNIVERSITY OF ARIZONA

## REGISTER

1909-10

WITH ANNOUNCEMENTS FOR  
1910-11

TUCSON, ARIZONA:  
KIMBALL & CUTLER, PRINTERS.  
1910

*1309*

## CALENDAR

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### 1910.

Sept. 15, Thursday.....Entrance Examinations.  
Sept. 16, Friday.....Condition Examinations.  
Sept. 19, Monday.....Registration Day.  
Sept. 20, Tuesday.....First Semester begins.  
Nov. 23, Wednesday.....Thanksgiving Recess begins.  
Nov. 28, Monday.....Instruction resumed.  
Dec. 23, Friday.....Holiday Recess begins.

### 1911.

Jan. 3, Tuesday.....Instruction resumed.  
Jan. 26, 27, 28,.....First Semester Examinations.  
Jan. 28 Saturday.....First Semester ends.  
Jan. 30, Monday.....Second Semester begins.  
Feb. 22, Wednesday.....Holiday.  
May 28, Sunday.....Baccalaureate Discourse.  
May 27, 29, 31,.....Second Semester Examinations.  
May 30, Tuesday.....Exhibition Military Department.  
June 1, Thursday.....Commencement.

## BOARD OF REGENTS.

### Ex-Officio.

HON. RICHARD E. SLOAN, A. B.....Phoenix  
HON. KIRKE TONNER MOORE, LL. B.....Phoenix

### Appointed by the Governor.

HON. MERRILL P. FREEMAN, Tucson.....August, 1913  
*Chancellor and President.*  
HON. GEORGE J. ROSKRUGE, Tucson.....August, 1913  
*Secretary.*  
HON. CHARLES H. BAYLESS, A. M., Tucson, August, 1913  
*Treasurer.*  
HON. A. V. GROSSETTA, Tucson.....August, 1911

---

Regular meetings on the 10th of each month.

# OFFICERS OF INSTRUCTION, INVESTIGATION AND ADMINISTRATION.\*

## FACULTY.

KENDRICK CHARLES BABCOCK, Ph. D.

President's House, University Campus  
B. L., 1889, Minnesota; A. M., 1895, Harvard; Ph. D., 1896, Harvard.  
President; Professor of History and Economics. 1903.

WILLIAM PHIPPS BLAKE, A. M., Park Ave. and Rincon Road.  
Ph. B., 1852, Yale; A. M., Dartmouth; D. Sc., 1907, Pennsylvania;  
LL. D., 1908, Arizona.  
Professor of Geology, Emeritus. 1895.

ROBERT HUMPHREY FORBES, M. S. University Campus  
B. S., 1892, M. S., 1895, Illinois.  
Director and Chemist, Agricultural Experiment Station.  
1894.

FRANK NELSON GUILD, M. S. Olive Road  
B. S., 1894, M. S., 1903, Vermont.  
Professor of Chemistry and Mineralogy. 1897.

GEORGE EDSON PHILIP SMITH, C. E. 1195 Speedway  
B. S., 1897, C. E., 1899, Vermont.  
Irrigation Engineer, Agricultural Experiment Station  
1907.

JOHN JAMES THORNBURGH, A. M. Olive Road  
B. S., South Dakota (Agricultural); B. S., 1897, A. M., 1901,  
Nebraska.  
Professor of Biology; Botanist, Agricultural Experiment  
Station. 1901.

EDWIN MORTIMER BLAKE, Ph. D. 1245 Speedway  
Engineer of Mines, 1890; Ph. D., 1893, Columbia.  
Professor of Mathematics and Mechanical Engineering.  
1904.

---

\*Dates following titles indicate appointment to service in the University.

- CYRUS FISHER TOLMAN, Jr., B. S. 521 E. Third St.  
B. S., 1896, Chicago.  
Professor of Geology and Mining Engineering. 1905.
- WILLIAM WHEELER HENLEY, A. B. First St., near Vine St.  
A. B., 1905, Leland Stanford, Jr.  
Professor of Mechanic Arts. 1905.
- ANDREW ELLICOTT DOUGLASS, Sc. D., Olive Road and Speedway  
A. B., 1889; Sc. D., 1908, Trinity.  
Professor of Physics and Astronomy. 1906.
- ALBERT EARLE VINSON, Ph. D. 914 N. Fourth Ave.  
B. S., 1901, Ohio (State); Ph. D., 1905, Goettingen.  
Biochemist, Agricultural Experiment Station. 1905.
- CHARLES ALFRED TURRELL, A. M. 835 Tyndall Ave.  
B. S., 1896, Nebraska; A. M., 1901, Missouri.  
Professor of Modern Languages. 1904.
- LESLIE ABRAM WATERBURY, C. E. 327 E. Fourth St.  
B. S., 1902, C. E., 1905, Illinois.  
Professor of Civil Engineering. 1907.
- ROBERT RHEA GOODRICH, M. S. 645 E. Third St.  
B. S., (Mining), 1885; B. S., (Mechanical Eng.), 1901; M. S., 1902,  
Massachusetts Institute of Technology.  
Professor of Metallurgy. 1907.
- ROBERT WAITMAN CLOTHIER, M. S. 923 E. Sixth St.  
B. S. 1897; M. S., 1899, Kansas (Agricultural).  
Professor of Agriculture; Conductor of Farmers' Institutes. 1907.
- ERNEST SUTHERLAND BATES, Ph. D. 908 Speedway  
A. B., 1902, A. M., 1903, Michigan; Ph. D., 1908, Columbia.  
Professor of English. 1908.
- HIRAM McL. POWELL, 925 Tyndall Ave.  
Captain, U. S. A., 1890, West Point.  
Professor of Military Science and Tactics. 1909.

- GEORGE FOUCHE FREEMAN, B. S. 817 E. Fifth St.  
 B. S., 1903, Alabama Polytechnic Institute.  
 Plant Breeder, Agricultural Experiment Station. 1909.
- AUSTIN WINFIELD MORRILL, Ph. D. 235 W. Monroe St., Phoenix.  
 B. S., 1900, Massachusetts Agricultural College; B. S., Boston, 1900;  
 Ph. D., 1903, Massachusetts Agricultural College.  
 Entomologist, Agricultural Experiment Station, and  
 of Arizona Horticultural Commission. 1909.
- FREDERICK W. WILSON, B. S. Experiment Station Farm, Phoenix.  
 B. S., 1905, Kansas (Agricultural).  
 Associate Animal Husbandman, Agricultural Experiment  
 Station. 1905.
- WILLIAM BURNETT MCCALLUM, Ph. D. 136 Speedway  
 B. S. A., 1894, Toronto; Ph. D., 1904, Chicago.  
 Associate Botanist, Agricultural Experiment Station. 1907
- WILLIAM GEORGE MEDCRAFT, A. M.  
 Rust Flats, First Ave. near Third St.  
 A. B., 1898, A. M., 1904, Kansas Wesleyan.  
 Assistant Professor of Mathematics. 1905.
- RAYMOND C. BENNER, Ph. D. Fourth St. and Highland Ave.  
 B. S., 1902, Minnesota; M. S., 1905, Ph. D., 1909 Wisconsin.  
 Assistant Professor of Chemistry. 1906.
- HENRY ALFRED ERNEST CHANDLER, B. S.  
 North Hall, University Campus.  
 B. S., 1905, Northwestern.  
 Assistant Professor of History and Economics. 1908.
- WILLIAM HORACE ROSS, Ph. D. 833 E. Fourth St.  
 B. S., 1903, M. S., 1904, Dalhousie; Ph. D., 1907, Chicago.  
 Assistant Chemist, Agricultural Experiment Station. 1907.
- FRANK CALEB KELTON, B. S. 412 E. Fourth St.  
 B. S., 1904, Arizona.  
 Assistant Engineer, Agricultural Experiment Station. 1909.

MARION CUMMINGS STANLEY, B. L. Center St. near Speedway.  
B. L., 1900, California.  
Instructor in Philosophy. 1902.

ESTELLE LUTRELL, A. B. Rust Flats, First Ave. near Third St.  
A. B., 1896, Chicago.  
Instructor in English, Librarian. 1904.

FREDERICK EDWIN TALMAGE, B. L. Olive Road.  
B. L., 1903, California.  
Instructor in Stenography and Bookkeeping. 1904.

LEVONA PAYNE NEWSOM, Ph. D. Fourth St. and Euclid Ave.  
A. B., 1892, Ph. D., 1895, Franklin.  
Instructor in Latin. 1905.

IDA CHRISTINA REID, Ph. B. 149 E. Pennington St.  
Ph. B., 1906, Arizona.  
Instructor in History and Mathematics. 1906.

CAROLINE BATES SINGLETON, A. B. Center St. near Speedway.  
A. B., 1906, Wellesley.  
Instructor in English. 1908.

ETHELBERT WEBB WALDRON, A. B. 835 Tyndall Ave.  
A. B., 1905, Michigan.  
Instructor in English. 1908.

HELEN JANE ALDRICH, Ph. D. 1018 Lowell Ave.  
A. B., 1904, Minnesota; A. M., 1905, Ph. D., 1909, Colorado.  
Instructor in Modern Languages. 1908.

FRANK LEWIS KLEEGERGER, B. S. South Hall, University Campus.  
B. S., 1908, California.

Instructor in Physical Training and Mathematics; Director of the Gymnasium. 1908.

ELIZABETH ELLINWOOD ROBERTS, A. B. 528 E. Second St.  
A. B., 1906, Western Reserve.  
Instructor in German. 1908.

WILLIAM LUCIUS FOWLER, B. S.

South Hall, University Campus

B. S., 1909, Missouri.

Instructor in Animal Husbandry. 1909.

JOHN ISAACSON

N. Main St. and Fifth Ave.

Instructor in Shop Practice. 1909.

JAMES GREENLEAF BROWN.

Olive Road.

Instructor in Botany. 1909.

\*FRANCES CROWELL

522 E. Second St.

Instructor in Music. 1909.

WILLIAM JAMES GALBRAITH, JR.

725 E. Fourth St.

A. B., 1906, Leland Stanford Jr.; J. D., 1908, Chicago.

Instructor in Law.

---

DANIEL TREMBLY MACDOUGAL, Ph. D.

Park Ave. and Rincon Road

(Director of the Department of Botanical Research of the Carnegie  
Institution of Washington.

Honorary Lecturer on Heredity and Evolution.

### ADMINISTRATIVE OFFICERS AND ASSISTANTS.

FREDERICK EDWIN TALMAGE, B. L. Olive Road  
Secretary of the University. 1904.

E. DANA TROUT. 803 E. Seventh St.  
Secretary of the Agricultural Experiment Station. 1909.

MILES M. CARPENTER, B. S.      North Hall, University Campus  
 Clerk in President's Office.      1907.

HERBERT BROWN. 220 N. Court St.  
Curator of the Territorial Museum.

LURENA MERRIMAN.      West Cottage, University Campus  
Preceptress of Young Women. 1907.

ARTHUR W. OLCOTT, M. D. 237 N. Main St.  
Medical Examiner for Men. 1905.

FRANK LEWIS KLEEBERGER. South Hall, University Campus  
Head of South Hall. 1907.

HENRY ALFRED ERNEST CHANDLER, B. S.  
Head of North Hall. 1909.

WALTER M. COLE, University Campus  
Superintendent of Grounds. 1907.

THEODORE CHAPIN, B. S.  
Assistant in Geology.

MISS MABEL A. GUILD.  
Assistant Librarian.

LAWRENCE A. CALLOWAY.  
Assistant in Chemistry

FLETCHER MORRIS DOAN, JR.  
Assistant in Metallurgy.

LESLIE CREIGHTON MILLER.  
Assistant in Physics.

ERNEST ORRIN BLADES.  
Assistant in Civil Engineering.

MINER LOUIS HARTMAN.  
Assistant in Chemistry and Metallurgy.

MAMIE W. CORDA.  
Assistant in Botany.

are undergoing extensive expansion and re-building, and so furnish excellent opportunities for observation and vacation employment for students of civil engineering.

### LOCATION AND CLIMATE.

The University of Arizona is located at Tucson, a city of eighteen thousand inhabitants, on the main line of the Southern Pacific railway, 312 miles west of El Paso, Texas, and 500 miles east of Los Angeles, Cal. The city lies in a broad flat valley at an elevation of 2,400 feet above sea level and is surrounded by mountains. Its dry, mild, and equable climate has made Tucson a famous winter resort unsurpassed for healthfulness.

The winter climate is especially good; the temperature is cool and strengthening but not severe, the lowest temperature recorded during the average year being about twenty degrees above zero, Fahrenheit. Little rain falls during the winter; fogs are all but unknown; cloudy days are rare. The percentage of sunshine throughout the winter is greater than that recorded at any other place in the United States. Owing to the extreme dryness of the air the highest temperatures known are less oppressive to the senses and less dangerous to the health than the summer heats of the upper Mississippi Valley states. The total amount of rainfall averages less than twelve inches.

These advantages insure to students a comfortable education and a wide range of out-door sports and recreations throughout the college year.

The University Campus, consisting of fifty-five acres, is situated upon high ground about a mile from

the business center of the city with which it is connected by an excellent electric street-car line. On every side it commands a view of mountain scenery of remarkable extent and grandeur. The buildings are lighted by electricity furnished by the city plant.

An abundant supply of unusually good water for household, laboratory, and irrigation purposes is drawn from a large well on the Campus from a depth of one hundred and twenty feet, thus securing immunity from the dangers of a contaminated water supply. The Campus has a complete sewer system connecting all the buildings, with one exception, with the city mains at the University gate.

The Campus, carefully laid out in drives, lawns, and gardens, with a large number of palms, olive, ash, umbrella, pepper, bagota, and cottonwood trees has the air of a well kept park.

### BUILDINGS.

The main building, University Hall, the oldest of the group, is 200 x 150 feet, two stories in height, the first of gray stone, the second of red brick. It is completely surrounded by a wide two-story veranda. The building contains recitation rooms, laboratories and apparatus rooms of various departments, an assembly room, and the office, laboratories and library of the Agricultural Experiment Station.

The Library and Museum building is a handsome structure of red brick and Bedford sandstone, with a massive tile roof. The interior finish is in natural oak and pine. The library reading room, on the second floor, is a large, well-lighted room, beautifully furnished with heavy solid oak reading tables, desks and wall

Arizona,—the colleges of liberal arts, the schools of mining and engineering, the agricultural college, and the agricultural experiment station, which in some States have been widely and completely separated. No professional schools of law, medicine, dentistry, or music have been established. In compliance with the provisions of the Act creating it, the University consists of

- I. The College of Agriculture and Mechanic Arts.
- II. The School of Mines.
- III. The Agricultural Experiment Station.
- IV. The Preparatory Department.

The Normal Department, authorized by the statute, has not yet been organized. The Preparatory Department, which is really a first class manual training high school with a four years course, will gradually disappear as the educational system of the Territory is developed by the establishment of efficient high schools, but no date is set for abolishing even the first year of this preparatory course.

The University in all departments is open to properly qualified persons of both sexes. Through the aid received from the United States and from the Territory, it is enabled to offer its privileges to residents and non-residents, with only very moderate charges. The number of students in any one class or section of a class is kept below twenty, in order that each student may receive the individual attention of the instructors and thus gain the full advantage derivable from a small school.

The purpose of the University of Arizona is, in the language of the organic law, "to provide the inhabi-

tants of this Territory with the means of acquiring a thorough knowledge of the various branches of literature, science, and the arts," and so far as possible a technical education adapted to the development of the peculiar resources of Arizona. In furtherance of this latter purpose, instruction is provided especially in subjects fundamental to agriculture, the mechanic arts, mining and metallurgy. The University, by the nature of its situation, frankly lays its strongest emphasis upon the course in mining engineering. It is, in reality, a great mining laboratory, surrounded as it is on all sides by great mines. Some of these mines developed on a large scale are within a few miles of the city, and the number and magnitude of such enterprises are steadily increasing. Probably no University in the United States offers such fine advantages to the students of mining engineering who desire to see the actual operation of great mines, or the development of great enterprises, while carrying on the theoretical and experimental work of the mining course.

The advantages in civil engineering are hardly less noteworthy, for Tucson is not only a division point on the main line of the Southern Pacific railroad, with large shops, roundhouses, and engineering offices, but it has the administrative and engineering headquarters for five of the subsidiary or allied lines of the Southern Pacific system in Arizona and in Sonora, Mexico, commonly known as the Randolph lines, including the great West Coast Line which will reach from Guaymas to Mazatlan and Guadalajara, in Mexico. All of these lines

**STANDING COMMITTEES.**  
**1909-1910.**

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The President is ex-officio member of all committees.

**Executive.**

Professors Forbes, Tolman, E. M. Blake.

**Registration and Classification.**

Professors E. M. Blake, Waterbury, Medcraft, Chandler.

**Library.**

Professors E. M. Blake, Turrell, Miss Lutrell.

**Public Exercises.**

Professor Medcraft, Miss Lutrell.

**Co-operative Association.**

Mr. Talmage.

**Rhodes Scholarship.**

President Babcock, Professors Guild, Bates.

# UNIVERSITY OF ARIZONA

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Established by Act of Legislative Assembly, 1885; Open to Students, October, 1891.

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## PURPOSE AND ORGANIZATION.

The University of Arizona is an integral part of the system of public education established by and for the Territory, and aims, as the head of such system, to fill the same position as that occupied by the State Universities in such states as California and Wisconsin. Its general organization is in accordance with the Act of Congress of July 2, 1862, known as the Morrill Act, creating the "Land Grant Colleges." The details of its organization and government are regulated by the Act of the Legislative Assembly of the Territory of Arizona, passed in 1885, and embodied, with amendments, in the Revised Statutes of Arizona Territory, 1901, which vests the government of the institution in a corporation styled the Board of Regents of the University of Arizona, consisting of the Governor and Superintendent of Public Instruction of the Territory, ex-officio, and four other members appointed by the Governor for a term of four years.

In creating the University, the Legislative Assembly wisely followed the example of the great states of Wisconsin, Illinois, Minnesota, Nebraska, and California, in unifying under one management the various schools and institutions of higher learning or investigation in

cases. The stack room at the rear is fitted up with the most modern steel stacks. The Museum occupies parts of the first floor and the west half of the second floor. Fine oak and plate glass cases constitute the furnishings. The offices of the president and secretary of the University, three lecture rooms for the departments of geology, mathematics, English and history, work rooms for the library and museum, and a laboratory for the department of geology are on the first floor.

Science Hall, a new building, of architecture harmonious with the Library, which it faces, was completed in April, 1909, at a cost of about \$40,000. Further appropriation was made in March, 1909, for furnishing and equipping the building, which was thus made ready for occupancy in September, 1909. The building, 145 x 60 feet, is of three stories, the first devoted to physics, the second to chemistry and mineralogy, and the third to botany and biology. The roomy attic and a superstructure on the roof are used as an astronomical observatory. The forty rooms provided by this Science Hall give excellent accommodations in place of the crowded quarters endured by several departments in recent years in University Hall, and the removal of these departments to the new building gives the Agricultural Experiment Station much needed space for its expanding work.

North Hall, a dormitory, two stories in height, built of gray stone of fine quality, is occupied by the college men. Besides the parlor, and rooms of the instructor in charge, it contains seventeen rooms, each large enough to accommodate two students, besides bath and toilet rooms.

South Hall, a large brick building containing forty rooms, besides bath and toilet rooms and store rooms, is the dormitory mainly for preparatory students. It is heated by a hot water system. It will accommodate seventy-five students.

West Cottage, with its new four-room annex, is the dormitory for young women,—a two story brick house with wide porches, surrounded with vines, shrubbery, lawns and trees.

The Dining Hall, built of red brick, provides ample boarding accommodations for all persons living on the Campus.

The Shop and Assay building is a large, substantial brick structure. It contains a commodious drawing room for mechanical and free-hand drawing, a large laboratory for forge work, machine practice and carpentry, and a lecture room, instrument room, and material testing laboratory for the department of civil engineering. Two other rooms are used for lockers, and for the motor and engine. The assay laboratory and commercial assaying department occupy five rooms fully equipped with a large melting furnace, the necessary muffle furnaces, and other accessories for making complete and accurate assays.

The Mill or Mining Machinery building, located to the northeast of the main group of buildings, is a plain wooden structure in which are placed the stamp mills, jigs, concentrating tables, separators, etc., necessary for the mining laboratory.

Herring Hall, the gymnasium, is a very substantial high building, 40 x 80 feet, constructed of red brick and white plaster. It was erected in 1903, the gift of

Professor James Douglas and his associates of the Copper Queen Consolidated Mining Company, through Colonel William Herring, after whom it was named, at the suggestion of Professor Douglas.

The pump house and mechanical engineering laboratory was built in 1905. By the use of brick, cement and iron it is practically fire proof, thus insuring safety to the well and pumps supplying the University with water for all its uses.

Two two-story brick residences are occupied by the President of the University and by the Director of the Agricultural Experiment Station.

Other buildings are the cottage occupied by the Superintendent of Buildings and Grounds, three greenhouses, a brick barn, and various smaller outbuildings used for shops and store rooms.

#### MAINTENANCE.

The University is maintained by funds appropriated by the United States and by the Territory of Arizona. Fifty-seven sections of very valuable pine land in Cocoino county have been set apart by the Federal government for the benefit of the University, but title and control of the land does not pass to the Board of Regents until the Territory is admitted as a State. In the meantime only a small sum is annually received from the leases of this land.

By the provisions of the Morrill Act of 1890, the University receives annually from the United States the sum of \$25,000 "to be applied only to instruction in agriculture, the mechanic arts, the English language and the various branches of mathematical, physical, natural and economic science, with special reference

to their applications in the industries of life, and to the facilities for such instruction." This Morrill Fund is to be ultimately duplicated by the Nelson Fund, created by the Act of March 4, 1907, which appropriated \$5,000 for the year beginning July 1, 1907, and provided for an annual increase of \$5,000 until the total received by each state should be \$50,000 per year from the two funds. For the current year this fund amounted to \$40,000. The University receives from the same source, for the support of the Agricultural Experiment Station, \$15,000 yearly from the Hatch Act of 1887; the Adams Act of 1906, for the current year yields \$13,000, which is to be increased annually by \$2,000 until it also produces \$15,000, giving the Station ultimately \$30,000 per year.

The appropriations by the Territorial Legislative Assembly of 1909 were \$35,500 per year, for two years, for maintenance; \$13,100 for the work of the Agricultural Experiment Station for two years; and \$11,500 per year for two years for improvements.

In 1909 the El Paso & Southwestern System gave the University \$2,000 for the work of the Agricultural Experiment Station in carrying on experiments in dry farming in Cochise county.

The University also receives annually, from miscellaneous sources such as matriculation and tuition fees, rent of cottages, damage to University property, etc., about \$1,500. The receipts for board, lights, etc., amount to about \$16,000 per year.

#### ENDOWMENT.

By the munificence of Doctor James Douglas, of New York, the University received in June, 1908, "the

sum of \$10,000 \* \* \* the annual interest or income from which is to be annually applied, devoted, expended and used by said Board of Regents, or its successors in trust, for the purchase of instruments of precision and research, or special apparatus, for scientific instruction and education in the department of mineralogy and School of Mines of the University of Arizona, \* \* \* but no part of said fund or income is to be used or applied to the purchase of mining or metallurgical machinery or supplies for said department or for the use of the students in the chemical or metallurgical laboratories." The fund thus created has been named by the Board the Douglas Endowment Fund.

The Philo Sherman Bennett Scholarship is endowed by the gift of \$500 to the University in 1905, through the agency of Mrs. William Jennings Bryan, the income to be used in aiding young women to secure an education.

#### LIBRARY.

The library contains 15,000 bound volumes and several thousand unbound bulletins and reports, chiefly agricultural. The accessions for the scholastic year 1909-10 were 1400 volumes, exclusive of government documents. Of these volumes a collection of complete sets of scientific and literary periodicals, to which additions are made yearly, is of special service in reference work. The library was made a regular depository of United States Government documents in 1907. These publications have been placed in a separate room where they are arranged and numbered according to the government check list. The library of the Experiment Station in University Hall contains a very complete set of Experiment Station literature, together with the

card index to this material issued by the U. S. Department of Agriculture.

The books are classed by the decimal system and shelved in numerical order with a further author division according to the Cutter numbers. The catalogue is the usual dictionary card catalogue of authors, subjects and titles in one alphabetical arrangement. Printed cards from the Library of Congress are used, supplemented by typewritten cards for books reported as not in their stock. The library has been entirely re-catalogued on this plan in all subjects but one, and this is nearing completion.

The Reading Room is supplied with about 600 books of general reference which may be consulted by the students without any formality. All books with the exception of periodicals and books reserved for reference may be drawn for home use. The following current periodicals and newspapers are on file for the use of students and general readers in the Reading Room.

#### PERIODICAL LIST.

|                                                       |                                                      |
|-------------------------------------------------------|------------------------------------------------------|
| American Architect and Building News,                 | American Journal of Pharmacy,                        |
| American Blacksmith,                                  | American Journal of Science,                         |
| American Chemical Journal,                            | American Journal of Sociology,                       |
| American Chemical Society,                            | American Machinist,                                  |
| Journal,                                              | American Magazine,                                   |
| American College,                                     | American Mathematical Society,                       |
|                                                       | Bulletin,                                            |
| *American Economist,                                  | American Mathematical Society,                       |
| American Forestry,                                    | Transactions.                                        |
| American Geographical Society,                        | American Naturalist,                                 |
| Bulletin,                                             | *American Philosophical Society                      |
| American Historical Review,                           | Proceedings,                                         |
| American Institute of Mining Engineers, Transactions, | American Society for Testing Materials, Proceedings, |

- American Society of Civil Engineers, Transactions,  
 Annalen der Physik,  
 Annales des Mines,  
 Archiv. f. d. Studium d. neueren Sprachen.  
 \*Arizona Mining Journal,  
 Association of Engineering Societies, Journal.  
 Astrophysical Journal,  
 Athenaeum,  
 Atlantic Monthly,  
 Australian Mining Standard,  
 Biedermann's Zentralblatt für Agrikulturchemie,  
 \*Bookbuyer,  
 Bookman,  
 Botanical Gazette,  
 Breeder's Gazette,  
 Breeders' Special,  
 \*California Cultivator,  
 Canadian Entomologist,  
 Canadian Mining Journal,  
 \*Canal Record,  
 Cassier's Magazine,  
 Cement,  
 Centralblatt f. Mineralogie,  
 Century,  
 Chemical, Metallurgical and Mining Society of South Africa, Journal.  
 Chemical News,  
 Chemical Society, Journal, (London),  
 Chemisches Centralblatt,  
 Collier's Weekly,  
 Country Life in America,  
 Craftsman,  
 Cumulative Book Index,  
 Current Literature,  
 Deutsche chemische Gesellschaft, Berichte,  
 Dial,  
 Economic Geology,  
 \*Educational Gazette,  
 Educational Review,  
 Electrical Review,  
 Electrical World,  
 Electrochemical and Metallurgical Industry,  
 Engineering and Mining Journal.  
 Engineering Index,  
 Engineering Magazine,  
 Engineering News,  
 Engineering Record,  
 Englishe Studien,  
 Espana moderna, La.,  
 \*Farmer's Voice,  
 Fern Bulletin,  
 Forum,  
 Franklin Institute, Journal,  
 Geological Magazine,  
 Geological Society of America, Bulletin,  
 Geologisches Centralblatt,  
 Good Housekeeping,  
 Graphic (London),  
 Harper's Monthly Magazine,  
 Harper's Weekly,  
 Havana University, Revista de la Facultad de letras y ciencias,  
 Illustracion espanola y americana,

- |                                |                                   |
|--------------------------------|-----------------------------------|
| Institut de France, Paris,     | *Our Dumb Animals,                |
| Academie des Sciences,         | Out West,                         |
| Comptes rendus des Seances,    | Outing,                           |
| International Studio,          | Outlook,                          |
| Irrigation Age,                | *Pacific Miner,                   |
| Journal of American Folk-lore, | Philosophical Review,             |
| Journal of Geography,          | Physical Review,                  |
| Journal of Geology,            | Plant World,                      |
| Journal of Political Economy,  | Poet-lore,                        |
| Ladies' Home Journal,          | Political Science Quarterly,      |
| Literarisches Zentralblatt,    | Popular Astronomy,                |
| Literary Digest,               | Popular Science Monthly,          |
| Living Age,                    | Power,                            |
| *Lowell Observatory, Bulletin, | Practical Engineer,               |
| McClure's Magazine,            | *Prairie Farmer,                  |
| Machinery,                     | Public Libraries,                 |
| Manual Training Magazine,      | Publishers' Weekly,               |
| Mexican Mining Journal,        | Quarterly Journal of Econom-      |
| Mineral Industry,              | ics,                              |
| Mines and Methods,             | Queensland Government Min-        |
| Mines and Minerals,            | ing Journal,                      |
| Mining and Scientific Press,   | Readers' Guide to Periodical      |
| Mining Magazine (London),      | Literature.                       |
| *Mining Reporter,              | Review of Reviews,                |
| *Mining Review,                | Revue des deux Mondes,            |
| Mining Science,                | Saturday Review (London),         |
| *Mining World,                 | School Review,                    |
| Modern Language Association    | School of Mines Quarterly,        |
| of America, Publications,      | Science,                          |
| Modern Philology,              | Scientific American,              |
| Monist,                        | Scientific American Supple-       |
| Musician,                      | ment,                             |
| Nation,                        | Scribner's Magazine,              |
| National Geographic Magazine,  | Société française de Mineralogie, |
| Nature,                        | Bulletin,                         |
| Neues Jahrbuch f. Mineralogie, | Society of Chemical Industry,     |
| Nineteenth Century and After,  | Journal,                          |
| North American Review,         | South African Mining Journal,     |

|                                  |                                    |
|----------------------------------|------------------------------------|
| Torrey Botanical Club, Bulletin. | Zeitschrift f. analytische chemie, |
| *Western Chemist and Metal-      | Zeitschrift fur anorganische       |
| lurgist,                         | chemie,                            |
| World's Work,                    | Zeitschrift fur physikalische      |
|                                  | chemie,                            |

NEWSPAPERS ON FILE IN THE READING ROOM.

|                               |                               |
|-------------------------------|-------------------------------|
| *Arizona Blade,               | Mojave County Miner,          |
| *Arizona Bulletin,            | New York Evening Post (Satur- |
| Arizona Daily Star,           | day),                         |
| *Arizona Gazette,             | *Oasis,                       |
| Arizona Range News,           | Prescott Weekly Courier,      |
| *Arizona Silver Belt,         | Southwestern Stockmen,        |
| Arizona Weekly Journal-Miner, | *Tempe News,                  |
| Bisbee Review,                | Tucson Citizen,               |
| Coconino Sun,                 | Tucson Post,                  |
| Los Angeles Times,            | Tombstone Epitaph,            |
| *Graham County Guardian,      | Weekly Republican.            |

The Carnegie Library of the City of Tucson is also open to the use of the students of the University. This library is also a depository of United States Government documents.

MUSEUM.

The Seventeenth Legislative Assembly of Arizona established a general museum at the University, to promote the collection of materials of all kinds illustrating the resources and development of Arizona, and particularly to preserve historical relics, including those pertaining to the aboriginal inhabitants. Donations of specimens and collections will be received and acknowledged with thanks, but no special provision has yet been made by the legislature for the support of this department, aside from a small appropriation for the salary of a curator.

The professors of the University have the immediate care of the collections pertaining to their respective departments. The collections now displayed at the University comprize representative series of minerals, ores and rocks of Arizona. Among these may be particularly mentioned superb specimens from the mines of the Copper Queen Mining Company at Bisbee. There are also collections of typical rocks and minerals for comparison, and many specimens of ores from different parts of the United States and from abroad. It is desired to make the collection of ores and minerals fully represent the great mineral resources of Arizona.

The Museum is indebted to Mr. Herbert Brown, curator, for a large and valuable collection of skins of the birds of Arizona, which he has deposited in the Museum, as well as for a collection of ancient aboriginal pottery and other relics. The fossil skull and teeth of an elephant, and other fragmentary remains of extinct animals, sent from Yuma by Mr. Brown, deserve special mention.

Historical records of much value are gradually accumulating as a part of this museum, and an appeal is made to old settlers and others to bear this fact in mind when making disposition of articles bearing even remote relation to the early pioneers and their history. All records and data of any nature that can be gleaned are worthy of preservation, and it is earnestly desired to have them placed at the University, where they will always be accessible for reference.

#### AGRICULTURE AND HORTICULTURE.

For purposes of instruction and demonstration by the department of agriculture. as distinguished from the

Agricultural Experiment Station, the University has purchased a tract of eighty acres of rich alluvial land in the Rillito valley just north of the Campus, which will take the place of the twenty-three acres leased during the past year in the Santa Cruz valley. On this tract new construction will be undertaken during the coming summer with a view to a rapid and permanent development of a varied instructional plant to meet the needs peculiar to this part of the great Southwest. In addition to the regular laboratories in physics, chemistry, etc., a special laboratory for soil physics will be fitted up in University Hall for use in the coming year. An excellent seed collection, green houses and tracts for experimentation, and a well selected agricultural library are other valuable parts of the equipment of the department. Funds have already been set aside for the purchase of live stock for the work in animal husbandry.

In addition to regular courses of instruction in agriculture and horticulture, "Timely Hints for Farmers," issued under the auspices of the Experiment Station, are of distinct educational value. Three thousand farmers of the Territory are reached more or less regularly by timely publications on subjects of vital interest. Farmers' Institutes, announcements of which are made from time to time, are supplemented by short courses in agriculture.

Small and well selected agricultural libraries of small cost have been forwarded to a considerable number who have expressed a willingness to receive them.

#### BIOLOGY.

The biological laboratories are located on the third floor of Science Hall, in a fine suite of eight rooms, con-

venient and well-lighted; the equipment is such as is required for modern instruction and research in the biological sciences. The library and apparatus are well selected and adapted to the region and the courses offered.

The collections possessed by the department form a very important part of its equipment. The herbarium consists of 12,000 sheets of mounted plants, of which number 2,500 are included in the University botanical survey herbarium. The unique flora and fauna of the mountain, mesa and lowland collecting grounds, in close proximity to the institution, offer very attractive opportunities for instruction and research especially along ecological lines. The Desert Botanical Laboratory of the Carnegie Institution supplements in most admirable fashion the facilities of the University for investigation.

In addition to the above there are fifty cases of insects, a large case of seeds, articulate and disarticulate human skeletons, plaster and papier mache models of the important structures of the human anatomy, and duplicate material for study and dissection.

#### CHEMISTRY.

The chemical laboratories used for instruction occupy twelve laboratories, class rooms, storerooms, etc. on the second and third floors of the new Science Hall.

The laboratory used by Freshmen for the study of general chemistry and qualitative analysis is at the east end of the second floor of Science Hall. It was newly furnished throughout during the current year, with desks, hoods, racks, etc., and piped for both water and

gas. It has accommodations for forty-eight students.

The laboratory for quantitative analysis is at the west end of the second floor of Science Hall. It is thoroughly equipped for the teaching of volumetric and gasometric analysis, and metallurgical chemistry, including apparatus for the electrolytic determination of metals. The balance room contains analytical balances of the latest model so arranged as to insure a maximum of stability and accuracy.

A lecture and demonstration room fitted with sinks, cabinets, etc., completes an equipment of apparatus and collections adequate for first class instruction in both theoretical and practical chemistry.

The laboratory of physical chemistry, located on the third floor of the Science Hall, is well equipped with the following apparatus: Wanner's Optical pyrometer, Chateliers pyrometer, boiling point and freezing point apparatus, Pulfrich refractometer, large wave length spectroscope made by Adam Hilper, London, thermostats, polariscope, and apparatus for conductivity work and the determination of electromotive force.

Two small laboratories on the third floor are to be equipped for electro-analysis and advanced work in chemistry.

The laboratories of the Agricultural Experiment Station occupy four rooms on the first floor of the Main building. These are devoted to analytical work and chemical investigations relating to agriculture. Though not intended for the use of students they are of incidental value to the instructors and students through the investigations which are here conducted.

## CIVIL ENGINEERING.

The apparatus in this department has been chosen with the view of familiarizing the student with the instruments which are used in practical civil engineering work and in the allied branches of hydraulic and mining engineering. The equipment includes surveyors' and engineers' levels; plane table; stadia, level, and transit rods; aneroid barometers; odometer; automatic water registers; hook gauges; current meters; drafting instruments; mechanical calculators; planimeter; a complete set of apparatus for testing cement; and an Olsen Universal testing machine of 100,000 pounds capacity.

## GYMNASIUM.

Herring Hall, the gymnasium, is fully equipped for the purposes of the department of physical training and athletics. The apparatus is of standard make, and includes forty chestweights, dumb-bells, bar-bells, wands, Indian Clubs, Medart vaulting horse, parallel bars, horizontal bar, quarter-circle, abdominal chair, wrestling machine, finger machine, chest expander, chest developer, climbing rope, flying rings, traveling rings, striking bag and drum, jump and vaulting stands, fencing foils and masks, basket balls and goals, five large mats and a set of anthropometric apparatus.

In the basement are located ninety-six lockers, and five shower baths which are supplied with hot water from a heater with large reservoir.

The outdoor equipment consists of two baseball fields; a football field, six-lap track, and straightaway, at the rear of the gymnasium; five fine tennis courts; and a basketball court for girls.

## MATHEMATICS

Models are an important aid to the study of mathematics. The collection of the department includes thread models of about forty ruled surfaces of the third, fourth and sixth orders. These illustrate the theory of surfaces and are also valuable in the study of kinematics and linkages.

The Bulletin and Transactions of the American Mathematical Society, and the Encyklopedia der Mathematischen Wissenschaften are subscribed for by the University Library.

## MECHANIC ARTS.

The Shops and Drawing Rooms occupy a total floor area of about 8,000 square feet, divided into a large shop, and machinery room, with adjacent tool rooms, supply rooms and store rooms, a draughting room, model room, pattern room, lecture room, and offices.

The entire building is well ventilated and lighted, from above as well as from the sides. The drafting room is heated by steam.

The wood shop is equipped with a full assortment of hand tools, six turning lathes, a Universal woodworking machine, a Whitney dimension sawing machine, a band saw, a Universal trimmer, and a large grindstone with truing device.

The forge room contains twenty-four down-draught forges, twenty-four anvils, a combination shear and punch, a blacksmith's drill press and a full assortment of small tools and appliances. Blast is furnished by a No. 3 Sturtevant blower; the smoke and gases are removed by a 70-inch exhaust fan.

The machine shop contains one 24-inch Lodge and Shipley engine lathe with taper attachment, two 14-inch Lodge and Shipley lathes, one 14-inch Pratt and Whitney lathe with taper attachment, one 10-inch Reed speed lathe, one 16-inch Cincinnati shaper, one 24-inch by 6-foot Woodward and Powel planer, one Brown and Sharpe No. 2 Universal milling machine, one Brown and Sharpe No. 1 Universal grinder, one 24-inch Prentice Bros. drill press, one power hack saw, one drill grinder, one emery stand and one grinding attachment for lathes. A 1 1-2 ton portable crane and a 1-ton triplex chain hoist are used in handling the heavier work.

Each shop has its own tool room well arranged and supplied with small tools, gauges, measuring instruments, etc.

#### MECHANICAL ENGINEERING.

This department has a drafting and recitation room in the Library Building in addition to the regular drawing rooms of the department of Mechanic Arts. In this room is the catalogue file containing the trade literature of about five hundred leading manufacturers of the United States; the collection of working drawings consisting of over three hundred blue prints, and the sample collection of models, machine parts, valves, electrical fittings, insulating materials, abrasives, etc.

The mechanical and electrical laboratory, which occupies a large room adjoining the Pump House, is equipped for the study and operation of boilers, steam and gasoline engines, hydraulic and electrical machinery. Besides the machinery of the shop and mill which can be used for experimental purposes and for study of machine design, the University has a 45 h.p. tubular

boiler, 35 h. p. Atlas engine, 30 h. p. Scott engine, a 10 x 7 x 10 Worthington Duplex pump, a Duplex feed pump, a Cameron pump, a 3 h. p. and a 1-2 h. p. direct current electric motor, an injector, a 500-gallon fire pump, a 40 h. p. Fairbanks-Morse gasoline engine, a 23 k. w. direct current Crocker-Wheeler generator, electrical measuring instruments, and a steam gauge tester. A 300-gallon two-stage centrifugal pump in the University well and its electric motor serve as part of the equipment for mechanical engineering.

#### METALLURGY.

The Mill, or metallurgical laboratory, is equipped for use by the students of metallurgy in connection with their work in testing ores as to their adaptability for treatment by different processes both on a large and a small scale.

The chief features of the equipment are: a Blake crusher, 4 in. by 7 in.; a Dodge crusher, 4 in. by 6 in.; sampling rolls, 6 in. by 9 in.; a cone and burr sample grinder; a pebble mill with a capacity of about 15 lbs. at one charge; a laboratory lightning crusher and a disc pulverizer; a 5-stamp mill, with 800-pound stamps; a 3-stamp mill, with 250-pound stamps; inside and outside amalgamated plates for the same; a 2-ft. clean-up pan; a 1-ft. amalgamation pan, and a 9-jar revolving agitator for testing samples of a few ounces; a No. 5 Wilfley table of the latest pattern, and a Hallett hand jig; a 1 1-2 ton cyanide plant for treating sands or dry crushed ore; two 150-lb. cyanide plants for treating smaller samples; 3-ft. agitator; a 12-in., 6-chamber, flush plate and frame, washing filter press and pump for the same; a Sturtevant shaking screen; a Tullock ore feeder;

a belt and bucket elevator, sampling plates, split samplers, a shaking screen, percolators, sizing screens from 1-mesh to 200-mesh, miners' pans, bateas, retorts, etc.

The power for operating this plant is furnished by a 30 h. p. Westinghouse induction motor, type C.

The assay laboratory is equipped with assay furnaces for crucible work, for scorifying and cupeling, and for retorting mercury from amalgam, besides all needed appliances for assaying by dry and wet method including electrolysis. The laboratory also has desks and fittings for the chemical work required in the metallurgical and mineralogical investigation and analysis of ores, in mineral fertilizers, and in qualitative tests of minerals.

#### MILITARY.

Room O, in University Hall, is used as an armory. It is fitted up with the necessary gun racks and accessories. The equipment includes 150 old style Springfield rifles, 100 Krag cadet rifles with complete accoutrements, eight sabers and belts, musical instruments for the band, and signal flags. A large clear area south of the Library building is kept leveled and smooth for a drill ground and parade ground. At the rear of the Mill building are the targets for short range practice.

Fifteen 10 x 12 army wall tents with poles, etc., and a mess outfit, constitute the camp equipment of the department of military science and tactics for use on practice marches and annual encampments.

#### MINERALOGY AND PETROGRAPHY.

The laboratories for mineralogy consist of two rooms on the second floor of the Science Building, one being used for microscopic work in petrography and the other

for blowpipe analysis and determinative mineralogy. The laboratory for microscopic work is equipped with seven petrographic microscopes including both American and foreign make, one Zeiss binocular for opaque work, models for illustrating axes of elasticity and spherical projection, a type set of rocks classified according to Rosenbusch's *Elemente der Gesteinlehre* with thin section corresponding, 120 oriented sections of minerals, and apparatus for photo-micrography and projection. The laboratory for blowpipe analysis is well supplied with minerals for making the necessary tests and studying the physical properties. A type set of 600 minerals classified according to Dana is included. For the study of crystallography, there is a collection of 300 pasteboard models of crystals, numerous glass and wooden models, three two-circle contact goniometers and one two-circle reflecting Goldschmidt goniometer of the most recent type, apparatus for the projection and drawing of crystals, and a model machine for cutting crystal models from plaster of Paris.

#### PHYSICS AND ASTRONOMY.

The department of physics occupies the entire first floor of the new Science Hall, where the facilities for the demonstration of all important phenomena are very complete. A lecture room seating forty persons is fitted with every modern convenience, such as lights, water, gas, heliostat, alternating and direct currents of great range, an opaque projection lantern, a double dissolving arc-light Ideal stereopticon, elevated seats, shutters for darkening the room, etc. Two large main laboratory rooms supply space for mechanical and electrical work, while separate special rooms are

devoted to heat, sound, light, magnetism and research work. A carpenter's shop, a repair and store room, a photographic dark and enlarging room, and a constant temperature room are provided. A pendulum seismograph will be installed in the magnetic laboratory and a special space has been provided for a 55-foot Foucault pendulum and the study of falling bodies.

An eight-inch Willyoung induction coil with storage and X-ray accessories is used in the study of high-tension electricity. Through the generosity of the Honorable Mark J. Egan, of Clifton, the University added to its equipment for the study of electricity a fine imported set of miniature wireless telegraphy apparatus, capable of transmitting messages about two hundred feet. The department is also equipped with three motor generator sets, the largest having an output of 7 kilowatts, with a Leeds and Northrup potentiometer and accessories, and with very complete apparatus for showing electro-magnetic phenomena, rotary fields, stationary electric waves, etc.

The astronomical observatory is at the top of the building where a sliding roof, 12 feet square, uncovers the telescope and discloses a clear horizon in every direction. An 8-inch Clark lens and mounting, both of the first quality, loaned to the University by the Observatory of Harvard University, Cambridge, Mass., are mounted on a cement pier supported on the main walls of the building, and give perfectly steady images. This lens is most efficient in fundamental research work. The equipment also includes a four and one-quarter inch Brashear telescope, sidereal and mean time clocks and pier for latitude and longitude observation.

## GENERAL INFORMATION.

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### COLLEGE OF AGRICULTURE AND MECHANIC ARTS.

The courses offered in the College of Agriculture and the Mechanic Arts provide both a liberal training along literary and scientific lines and technical training along engineering, mechanical and agricultural lines. Great latitude of election is given in the literary and scientific courses, but the courses in engineering are more rigid in their requirements. Full details of the various courses follow. The aim in all is to combine the practical with the theoretical instruction. The needs of a young and growing commonwealth are kept in mind, and a steady attempt is made to develop the adaptability and resourcefulness so necessary to meet changing conditions.

### ARIZONA SCHOOL OF MINES.

The School of Mines is designed for the education and training of young men in the arts and sciences directly involved in the industries of mining and metallurgy. Especial attention is given to the sciences of mathematics, physics, chemistry, mineralogy, geology and their applications. The Bureau of Mines and Assaying, while not directly connected with the work of instruction, affords with its laboratory and the influx of new material, a valuable object lesson to the advanced students of mining and metallurgy.

### REGISTRATION.

All students are expected to register on registration day at the beginning of the year and at the beginning

of the second semester, in the University office or in such rooms as may be designated on that day. Before making choice of elective subjects the student should in every case confer with the instructors concerned and with the committee on registration. All students are required to pay an annual incidental fee of \$5.00 at the time of registration, and no student will be considered registered and entitled to attend classes unless this fee has been paid. After registration no change in classes can be made without the consent of the committee on registration or the President.

Students entering from other institutions should present to the committee certified copies of their records in such schools, together with certificates of graduation or of honorable dismissal. A copy of the school catalogue or course of study should be furnished with the credentials, in order to facilitate the work of the committee.

#### TUITION.

Tuition is free to students of Arizona. For all non-resident students, tuition is \$10 for each semester. No reduction will be made for late registration or early withdrawal.

#### RECORDS.

The class standing of each student is determined by the instructor in charge. The method of ascertaining the student's record is left to the instructor, and his report in all cases is final. In addition to the reports at the end of each semester, which form the permanent records of each student, each instructor makes a monthly provisional report to the office on all students registered

in his courses, and a card showing the standing of each student is mailed to his parents or guardian every month.

### DISCIPLINE.

The disciplinary policy of the University in all its departments is based upon the assumption that the students are young gentlemen and young ladies who come to the institution with a high determination to utilize fully the opportunities offered, and with a keen sense of duty, honor and courtesy to each other and to the faculty. Formal and explicit prohibitions and rules are few, but those will be rigidly enforced, with adequate penalties, and good order and discipline will be maintained. The University is a civil rather than a military community, and such privileges as will not be abused will be allowed all classes of students. In aggravated cases, such as cheating in University work, frequenting saloons and other objectionable places, and serious breaches of peace or order, the faculty will not hesitate to proceed to the extreme measure of expulsion. In case of expulsion the student is required by regulations of the Regents and faculty to leave the campus immediately, and by Territorial statute to surrender his cadet uniform to the University. In all matters of discipline the faculty and President will strive for fairness, equity and efficacy rather than uniformity.

Students or classes desiring to make requests of the faculty should file their petition in the President's office before the hour of faculty meeting; class petitions must be presented at least two days before the time of meeting.

### VACATIONS AND HOLIDAYS.

A short recess (see Calendar, page 2) is taken at Christmas time. The long summer vacation begins about June first and continues until the middle of September. The Thanksgiving recess extends from the close of the regular exercises on the Wednesday before Thanksgiving to the next Monday morning. During the spring, the cadet companies make a practice march of from three to seven days, which constitutes in reality a third vacation for the preparatory department and for freshmen. All legal holidays are observed by the cessation of ordinary University work.

Arbor day has been formally adopted by the University Regents as the regular anniversary on which to celebrate the founding of the institution, in connection with the ceremonies of tree planting.

### LIVING ACCOMMODATIONS.

Provision is made so far as possible for furnishing board and rooms to students of both sexes upon the University grounds. Young men have comfortable quarters in South Hall, which can accommodate about seventy-five students, two in a room, and in North Hall (for College men only), which can accommodate thirty-five students. West Cottage, the home of the young ladies, is in charge of an experienced and capable preceptress, who has constant supervision of those rooming there.

All dormitories are lighted by electricity; South Hall is heated by a hot water system, the other dormitories being heated by stoves. Rooms contain a clothes press, and are provided with single bedsteads, table, chairs, mirror, wash bowl, pitcher, and slop jar. Stu-

dents will supply their own mattresses, pillows, sheets, blankets, towels, rugs, and brooms, and such other articles as they may desire for ornamenting their rooms. They will care for their own rooms under the direction of the head of each dormitory.

The Dining Hall of the University has accommodations for one hundred students. It is under the management of a paid steward who is responsible to the President and the Board of Regents. While the charge of \$18 per month for board is very low, it is the aim of the management to serve substantial, wholesome, appetizing meals. All students having rooms in the dormitories are required to take their meals at the Dining Hall. Students and members of the faculty who reside outside the dormitories, may board at the Dining Hall.

By resolution of the Board of Regents of the University, board is to be paid in advance on the twelfth of each month. If payment is not made before the fifteenth of each month, \$19.00 instead of \$18.00 will be charged for the month's board. Checks and postoffice or express money orders should be made payable to the President. No reduction in the bill for board will be made for a period less than one week, except by special arrangement at the office, made in advance.

#### FEES AND EXPENSES.

|                                                                    | LOW.    | HIGH.   |
|--------------------------------------------------------------------|---------|---------|
| Tuition free to students from Arizona. .                           |         |         |
| Tuition, students non-residents of Arizona, each semester. . . . . | \$10.00 | \$10.00 |
| Incidental fee, paid annually. . . . .                             | 5.00    | 5.00    |
| Mining excursions for advanced students                            | 20.00   | 40.00   |
| Military uniform, cadet gray. . . . .                              | 16.25   | 24.00   |

|                                 |       |       |
|---------------------------------|-------|-------|
| Military uniform, kahki.....    | 7.25  | 10.00 |
| Books, per annum.....           | 5.00  | 20.00 |
| Board, per month.....           | 18.00 | 20.00 |
| Lights per room, per month..... | .50   | 1.50  |
| Napkins.....                    | .50   | .50   |

## LABORATORY FEES.

Assaying. See Metallurgy 2.


|                                             |         |
|---------------------------------------------|---------|
| Botany, 1, 2, 3, 4, each.....               | \$ 2.50 |
| Chemistry 1, 2, each.....                   | 15.00   |
| Chemistry 3, 4, 5, 6, 7, each.....          | 15.00   |
| Chemistry 10.....                           | 5.00    |
| Chemistry III (Preparatory year).....       | 12.00   |
| Civil Engineering 1, 2, (year).....         | 3.00    |
| Civil Engineering 3, 11, 13, 15, each.....  | 1.00    |
| Civil Engineering 6, 7, 8, 9, 14, each..... | 2.00    |
| Geology 5, 6 (year).....                    | 10.00   |
| Mechanic Arts I, II, 1, 2 (each year).....  | 5.00    |
| Metallurgy 2, (Assaying).....               | 25.00   |
| Metallurgy 5A, 5B, 6, each.....             | 6.00    |
| Mineralogy 1, 2, (year).....                | 15.00   |
| Mineralogy 3, 4, (year).....                | 5.00    |
| Physics 1, 2, (year).....                   | 2.00    |
| Physics IV (year).....                      | 3.00    |

Text-books may be obtained directly from the publishers through a book association managed on the co-operative plan under the direction of the faculty.

Members of the cadet companies will be required to provide themselves with the prescribed uniform, which will be ordered by the University. The cost of the cadet grey, woolen uniform, is \$16.25. The uniform has shown better wearing qualities than a civilian suit of equal cost, and parents are urged to consider the

matter of uniform when supplying their sons with clothing for the approaching University year. It may be worn on all occasions, and thus will remove the necessity for additional expenditure for outer clothing other than overcoats. When the warm weather of spring comes, the students are expected to purchase the regulation khaki uniform and campaign hat, the total expense being about \$7.25.

#### ASSISTANCE TO STUDENTS.

The University has at present no loan funds with which to aid students who must earn their way. Various positions about the grounds, buildings and laboratories of the University, paying from \$4 to \$20 per month, are filled by students who must be self-supporting. The number, however, is not large, and preference is given to students from Arizona and to those who have spent time enough in the University to demonstrate that they are earnest, capable, reliable young men, likely to do this outside work and at the same time maintain a good record as students. During the academic year of 1908-9 forty-two different students were given assistance, totaling \$2,700, or an average of \$64.  The Philo Sherman Bennett scholarship, the income of \$500, for aiding young women to secure an education, was awarded in March, 1910, by vote of the Regents and Faculty to Janet V. Sine, class of 1912, and Dona De Luce, class of 1913, the accumulated interest making two awards of \$20 possible.

#### REQUIREMENTS FOR ADMISSION.

Applicants for admission to any department of the University will be required to furnish satisfactory evidence of good moral character, and certificate of gradua-

tion or of honorable dismissal from the schools with which they were last connected.

For admission to the Freshman class applicants must be at least sixteen years of age and must satisfy requirements in subjects sufficient to give fifteen and one-half credits as described below. A credit is understood to be the equivalent of one study pursued satisfactorily at least four times a week for one year, as ordinarily taught in high schools.

Students coming from approved high schools and preparatory schools, and presenting a detailed official statement of work completed from the principals of such schools, will be excused by the committee on registration from entrance examinations in those subjects covered by the credentials, with the exception of English composition. Other students will be required to pass the entrance examinations.

For admission to the course leading to the degree of Bachelor of Arts, the subjects and credits assigned each are:

|                         |    |                          |   |
|-------------------------|----|--------------------------|---|
| English.....            | 4  | Latin.....               | 2 |
| Algebra.....            | 1½ | Greek, French, German or |   |
| Plane Geometry.....     | 1  | Spanish.....             | 2 |
| History and Civics..... | 2  | Elective.....            | 2 |
| Science.....            | 1  |                          |   |

For admission to the course leading to the degree of Bachelor of Science, including the degrees of Bachelor of Science in Mining Engineering, Civil Engineering, Mechanical Engineering, of Metallurgy, the subjects and credits assigned each are:

|                              |    |                           |   |
|------------------------------|----|---------------------------|---|
| English . . . . .            | 4  | Latin, French, German or  |   |
| Mathematics . . . . .        | 3½ | Spanish. . . . .          | 2 |
| History and Civics . . . . . | 2  | Physics and Chemistry . . | 2 |
|                              |    | Elective . . . . .        | 2 |

### SCOPE OF THE ADMISSION REQUIREMENTS.

#### ENGLISH.

ENGLISH—4 credits. (a) English classics. An acquaintance with the works named below. These works are divided into two classes, those intended for thorough study and those intended for general reading. The portion of the examination devoted to the former class will be upon subject matter, form and structure. In addition the candidate may be required to answer questions concerning the leading facts in those periods of English literary history to which the prescribed books belong. In the portion of the examination devoted to the latter class, the candidate will be required to present evidence of a general knowledge of the subject matter, and to answer simple questions on the lives of the authors. The form of the examination will usually be the writing of a paragraph or two on each of several topics, to be chosen by the candidate from a considerable number—perhaps ten or fifteen—set before him in the examination paper. (b) English Composition. The examination will take the form of a theme of five hundred words on some subject familiar to the candidate and will be a practical test of his ability to express himself in writing clearly and consecutively. No candidate will be accepted whose work is notably defective in point of neatness, spelling, punctuation, idiom, or division into paragraphs. Those found lacking in compo-

sition will be required to make good the deficiency at once in a special class organized for that purpose.

No student will be admitted without examination, except on the certificate from his former instructors that the entire requirement has been fulfilled. Substantial equivalents, properly certified, will be accepted.

For thorough study, for 1910: Shakespeare's *Macbeth*, Milton's *Lycidas*, *Comus*, *L'Allegro* and *Il Penseroso*; Burke's *Speech on Conciliation with America* or Washington's *Farewell Address* and Webster's *First Bunker Hill Oration*; Macaulay's *Life of Johnson* or Carlyle's *Essay on Burns*.

For general reading and practice, selections will be made, at the discretion of the teacher from groups I-VI of College Entrance Requirements in English for 1910-1911.

#### MATHEMATICS.

ALGEBRA—1 1-2 or 2 credits. The work required in algebra covers the usual fundamental subjects, and extends through quadratic equations, radicals, and proportion, as given in Wells' *Essentials of Algebra*, or Wentworth's *High School Algebra*.

PLANE GEOMETRY—1 credit. A year devoted to the subject as treated in the text-books of Wells or Wentworth, emphasizing original exercises.

SOLID GEOMETRY—1-2 credit. A half year should be given to this subject, emphasizing the geometry of the sphere and the original exercises.

TRIGONOMETRY—1-2 credit. Plane trigonometry, only, is required. The student should be familiar with the use of logarithmic and trigonometric tables.

## HISTORY.

To meet the requirement in history the student will be expected to have used, in preparation for each credit, a good textbook, to have done regular reference work, and to have kept a notebook with outlines, summaries, maps, and topical notes on readings, varying in proportion, according to the advancement of the course.

ANCIENT HISTORY—to the year 800 A. D. 1 credit.

MEDIAEVAL AND MODERN HISTORY OF EUROPE—1 credit.

HISTORY OF ENGLAND—1 credit.

HISTORY AND GOVERNMENT OF THE UNITED STATES—1 credit.

## LANGUAGE.

\*GREEK—2 credits. As covered by Gleason and Atherton's *Beginner's Greek Book*; Xenophon's *Anabasis*, four books; Homer's *Iliad*, three books, with composition and the use of Hadley and Allen's or Goodwin's *Greek Grammar*.

\*LATIN—2, 3 or 4 credits. As covered by Collar's *First Latin Book* and *Viri Romæ*, together with Allen and Greenough's *Grammar* and texts; sight reading; *Cæsar*, four books, or an equivalent; Cicero, four orations; Virgil, six books; sight reading from Nepos, Cicero and Gellius; Daniell's or Bennett's *Prose Composition*.

\*GERMAN—2 credits. As covered by Bacon's *German Grammar*, with readings outlined for German 1, 2, 3, 4, or an equivalent.

\*SPANISH—2 credits. As covered by Hills and Ford's *Spanish Grammar* with readings, etc., outlined for Spanish 1, 2, 3, 4, or an equivalent.

\*FRENCH—2 credits. As covered by Fraser and Squair's *French Grammar* (Parts I and II) with readings, etc., outlined for French 1, 2, 3, 4, or an equivalent.

#### SCIENCE.

PHYSICAL GEOGRAPHY—1 credit or 1-2 credit. A year or half year of work which should include the principles of the subject, as treated in the best recent textbooks, field and laboratory study, and the interpretation and steady use of topographic and weather maps, charts, etc. This subject may be combined in half-credits with botany, zoology, or physiology, which may in their turn be offered as full credits if it is so desired.

BOTANY—1 credit or 1-2 credit. The course should cover a study of the life histories of types from the main groups of plants, and a series of simple physiological experiments. At least two-thirds of the course should consist of laboratory work.

CHEMISTRY—1 credit. A year's course of descriptive chemistry, consisting of both class-room and laboratory work, which should include the more common metals and non-metals and their compounds. A careful record of laboratory experiments should be kept.

PHYSICS—1 credit. Along with the use of one of the standard textbooks the year's course should include continuous and systematic laboratory practice, which should be recorded in a notebook.

#### ELECTIVES.

The electives offered for admission should be chosen from the above subjects or any other subjects ordinarily taught in high schools and accepted by reputable colleges and universities.

**ADMISSION TO ADVANCED STANDING.**

Students coming from other institutions of recognized standing may be admitted to classes above Freshman upon the presentation of properly authenticated certificates of work done, and when so admitted will be credited upon the records of this University with so much of such work as corresponds approximately with the courses required for the desired degree here. Certificates of record should be accompanied by statements of honorable dismissal or leave of absence, and a copy of the register or catalogue showing the content of the credits certified.

**ADMISSION FROM ARIZONA NORMAL SCHOOLS.**

By arrangements with the Arizona Normal School at Tempe, and the Northern Normal School at Flagstaff, students from these institutions will be received into the University without examination, and given credit for all work which is the equivalent of courses offered by the University either for admission or for a degree. Students from this University may also obtain the equivalent privilege at the Normal Schools by presenting the proper certificate of standing, signed by the President.

**ADMISSION UPON CERTIFICATE.**

Since the statutes of Arizona provide that the course of study in the high schools of the Territory "shall be such as, when completed, shall prepare its students for admission into the Territorial University," the University admits without examination, save in English composition, graduates of approved high schools of Arizona. Diplomas or corresponding credentials from high schools and preparatory schools in other states, accredited by

the state universities of such states, will excuse from examinations in subjects covered by such credentials, save in English composition.

Accredited four-years high schools in Arizona:

|          |           |
|----------|-----------|
| Bisbee,  | Phoenix,  |
| Clifton, | Prescott, |
| Douglas, | Tucson,   |
| Mesa,    | Yuma.     |

High schools which have not in operation the full four-years course:

|        |            |
|--------|------------|
| Globe, | Tombstone, |
| Tempe, | Willcox.   |

## COURSE OF STUDY AND DEGREES.


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All facilities and privileges of the University are open to qualified persons of both sexes.

The University offers four-years courses of study leading to the degrees of Bachelor of Arts and Bachelor of Science, and to those degrees specialized as shown on pages 52-54. In each course the work is partly required and partly elective, as described by schedules later. Each student doing full work is required to take not less than fifteen hours of class room work per week. In laboratory work a period of from two to three hours is considered the equivalent of one recitation or lecture hour.

Persons of mature age and with sufficient preparation, who are not candidates for degrees, may be admitted to regular classes as special students, provided, however, that in all such cases they show to the satisfaction of the instructors in charge that they can take the course with profit to themselves and without detriment to the regular class. It is expected that those who desire thus to specialize in mineralogy, assaying, geology or surveying, will have had at least a high school education, or its equivalent, particularly in English, algebra, geometry, physics and chemistry.

The faculty reserves the right to omit classes in any course of instruction unless a suitable number of students register for the course.

Students who complete satisfactorily the required work, and the specified amount of elective work, as shown in the accompanying schedules, will be given the degree of Bachelor of Arts or Bachelor of Science. The special character of any course of study is indicated by adding to the degree the name of the department, as Bachelor of Science in Mining Engineering. 

Military science and tactics and physical training are required during the freshman and sophomore years for all male students, and physical training for female students. If for any reason a student is excused from these exercises, an additional subject having a minimum of three recitation hours per week will be required.

Credit toward degrees is given by means of a unit system which assigns to each course of instruction offered a certain number of units of credits. A unit ordinarily represents one class-room hour per week, or its equivalent of two or three laboratory hours, for one semester. One hundred and thirty-one units, including three units in military science and tactics and physical culture, are required for obtaining a degree in any of the courses.

Any candidate for a degree may present as part fulfillment of requirements for graduation an acceptable thesis embodying the result of a special study of some subject within the range of the course pursued. The subject of the thesis must be submitted for the approval of the faculty at the opening of the senior year, and the completed thesis must be presented not later than three weeks before Commencement Day. The credit value will be determined by the faculty at the time the subject is approved.

**GROUPS OF SUBJECTS.****GENERAL:**

English, Philosophy, Mathematics, Military Science,  
Physical Training.

**GROUP A:**

Latin, Greek, French, German, Spanish.

**GROUP B:**

Economics, History, Law, Sociology.

**GROUP C:**

Agriculture, Astronomy, Botany, Chemistry, Geology,  
Mineralogy, Physics, Zoology.

**GROUP D:**

Civil Engineering, Mechanic Arts, Mechanical Engineering,  
Metallurgy, Mining Engineering.

**REQUIREMENTS FOR DEGREES.**

The units necessary for the different degrees are set forth in the following tabulations:

|                                   | Required | Free elective. |
|-----------------------------------|----------|----------------|
| <b>BACHELOR OF ARTS:</b>          |          | 29             |
| English.....                      | 24       |                |
| Philosophy.....                   | 12       |                |
| Mil. Science, Physical Training.. | 3        |                |
| Group A.....                      | 32       |                |
| Group B.....                      | 15       |                |
| Group C.....                      | 16       |                |
| Total, 131 units.                 |          |                |
| <b>BACHELOR OF SCIENCE:</b>       |          | 44             |
| English.....                      | 8        |                |
| Mathematics.....                  | 16       |                |
| Mil. Science, Physical Training.. | 3        |                |
| Group B.....                      | 4        |                |
| Group C and D.....                | 56       |                |
| Total, 131 units.                 |          |                |

**CIVIL ENGINEERING.**

(See Mining Engineering, p. 54, for First and Second Years.)

| III YEAR.                | UNITS | IV YEAR.              | UNITS. |
|--------------------------|-------|-----------------------|--------|
| Math. 5, 6.....          | 9     | Civ. Eng. 3, 6.....   | 4      |
| Astron. 4.....           | 3     | Civ. Eng. 7, 8.....   | 8      |
| Mineral. 1.....          | 4     | Civ. Eng. 13, 15..... | 6      |
| Physics 4.....           | 4     | Mech. Eng. 1, 2.....  | 6      |
| Civ. Eng. 9, 11, 14..... | 12    | Elective.....         | 6      |
|                          | —     |                       | —      |
|                          | 32    |                       | 30     |

**METALLURGY.**

(See Mining Engineering, p. 54, for First and Second Years.)

| III YEAR.          | UNITS | IV YEAR.                       | UNITS. |
|--------------------|-------|--------------------------------|--------|
| Math. 5, 6.....    | 9     | Metal. 1, 3, 4, 5, 7, 9, ..... | 13     |
| Mineral. 1, 2..... | 7     | Min. Eng. 1, 2.....            | 4      |
| Geol. 1, 2.....    | 8     | Civ. Eng. 14.....              | 4      |
| Chem. 5, 6.....    | 8     | Geol. 3.....                   | 3      |
|                    |       | Mech. Eng. 1, 2.....           | 6      |
|                    | —     |                                | —      |
|                    | 32    |                                | 30     |



**ADVANCED DEGREES.**

Advanced degrees will be given only for work done in residence, to candidates who have received the Bachelor's degree from this institution or one of similar standing. Thirty units of such work will be required for the degrees of Master of Arts and Master of Science, together with a thesis. The courses in each case will be laid out by those in charge of the departments in which the work for the degree is to be taken, and must be approved by a committee composed of all the heads of departments.

Students who expect to make mining engineering their profession are advised to take a fifth year, or a five-years course, since the four-years course gives insufficient time for a student to master all the subjects that are essential for the practice of mining engineering.

The requirements for the degree of Engineer of Mines are as follows:

Candidate must have completed the course leading to the degree of Bachelor of Science either in Mining Engineering, or in Metallurgy, as given by the University in Arizona, or the equivalent of either of these courses of some school of recognized standing.

The fifth year's course will consist of not less than 30 units of resident work, which will include (1) all of the following courses, the equivalent of which has not been taken by the candidate.: Geology 1, 2, 3, 4, 5, 6, 7; Mineralogy 1, 2, 3, 4; Mining Engineering 1, 2, 3, 4, 5, 6, 7, 8; Metallurgy 1, 2, 3, 4, 5, 7. (2) At least 8 units of graduate work in Mineralogy, Geology, Mining Engineering or Metallurgy. (3) The remainder of the 30 units may be chosen from any of the engineering departments, but should not be of lower

grade than Junior work. Six months of work underground and in smelters, with a satisfactory detailed report on the same, will be required. This work may be done during summer vacations.

## COURSES OF INSTRUCTION.

Courses having odd numbers are given in the first semester; those having even numbers, in the second semester. The hours mentioned show the number of periods per week. The subjects are arranged alphabetically.

### \*AGRICULTURE.

PROFESSOR CLOTHIER AND MR. FOWLER.

#### 1. Plant Culture and Orchard Management.

PROFESSOR CLOTHIER.

Elementary plant physiology, taking up the process of seed germination; the function of roots, stems, leaves, buds, flowers; the plant as affected by unfavorable environment. Plant propagation. Selection of orchard site; lifting, packing, shipping and transplanting trees and vines; cultivation, pruning, spraying, picking, packing and marketing fruits. Open also to preparatory students.

5 hrs., first semester. 4 units.

#### 2. Home and Market Gardening. PROFESSOR CLOTHIER.

Practical and theoretical training in the general principles underlying successful intensive farming and the adaptability of Arizona for this branch of farming.

3 hrs., second semester. 2 units.

#### 3, 4. Breeds or Farm Animals. MR. FOWLER.

The history of the origin and development of the various breeds of farm animals. Their leading characteristics. Practice in stock judging.

3 hrs., first semester; 3 hrs., second semester. 5 units.

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\*These courses in Agriculture are also open to students in the Short Course in Agriculture.

**5. Dairying.**

MR. FOWLER.

Production of sanitary milk on the farm, the management and care of a dairy herd, the composition and properties of milk, the manufacture of dairy products.

5 hrs., second semester. 4 units.

**6. Farm Management.**

PROFESSOR CLOTHIER.

The course in farm management will deal with the laying out of ranches or farms with reference to arrangement of ditches, buildings, roadways, pumping plants; application of water—ridge culture, flooding on slopes, on dead levels; cultivation with reference to moisture, alkali, sediments, weeds, latent fertility, control of climatic conditions, management of alkali; crop production, successions and rotations, marketing of farm produce, business aspects of farming, such as shipping associations, markets, transportation, and farm bookkeeping.

2 hrs., second semester. 2 units.

**\*7. Irrigation Engineering.** PROFESSOR WATERBURY

Measuring and handling of ditch water, pumping plants, steam and gasoline engines, electric motors.

5 hrs., first semester. 4 units.

**\*8. Soils.**

PROFESSOR CLOTHIER.

Origin, composition, and classification of soils; soil moisture and methods of conserving it, soil temperature and conditions influencing it, soil texture as affecting the supply of heat, moisture, and plant food; various culture methods in relation to soil texture, and plant food, surface tension, capillarity, osmosis and diffusion as affecting soil conditions; root development, mechanical analysis of soils.

5 hrs., second semester. 4 units.

**\*9. Poultry Husbandry.**

MR. FOWLER.

The general care and management of poultry, production of poultry products for the market, diseases and pests, characteristics of breeds.

3 hrs., second semester. 3 units.

**10. Veterinary Science.**

MR. FOWLER.

Animal physiology, sanitation, symptoms of common diseases and pests, and their remedies.

5 hrs., first semester. 4 units.

**11. Feeds and Feeding.**

MR. FOWLER.

The principles of animal nutrition, composition and digestibility of various feeds, construction and use of silos, economical feeding of animals for various purposes, balanced rations.

3 hrs., second semester. 3 units.

**12. Principles of Breeding.**

MR. FOWLER.

Principles governing breeding of plants and animals, atavism, reversion, heredity, correlation, selection, systems of breeding, Mendel's Law of Hybrids, modern practice in breeding.

5 hrs., second semester. 4 units.

**ASTRONOMY.**

PROFESSOR DOUGLASS.

The atmosphere of southern Arizona is perhaps the best in the United States for astronomical observation, having smaller percentage of cloud and less average wind velocity than any other locality where records have been preserved. The dry air and 2400 feet elevation give Tucson such a clear sky that faint stars may be watched till they set behind the distant horizon; the fine weather,

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\*Omitted 1909-1910.

day after day, gives opportunity for consecutiveness of observation not obtainable elsewhere; a greater portion of the year is available, with less interference from air currents.

The course in astronomy is arranged especially to draw attention to these advantages, and, at the same time, to give that understanding of the motions of the earth and planets which is so important in many branches of engineering. The eight-inch Harvard telescope with its Clark glass and the four and one-fourth inch Brashear telescope of the University will always be available for closer study of the heavenly bodies. Two excellent clocks with electric connections for transmitting time give opportunity for longitude, latitude and time observations. It is hoped in the coming year to install other instruments that will take advantage of the exceptionally favorable conditions so peculiar to Arizona.

**1, 2. Descriptive Astronomy. PROFESSOR DOUGLIASS.**

The study of the sun, moon, and planets and other celestial objects, with constant views of their telescopic appearance, and discussion of the latest theories of the evolution of the universe and the condition of the planets. Non-mathematical; open to all students.

2 hrs., or an equivalent, both semesters. 4 units.

**3, 4. Engineering Astronomy. PROFESSOR DOUGLASS.**

Latitude, longitude, and time observations, and their reductions, with practice work; astronomical measurement; adjustment and handling of instruments. Course 4 is required of sophomores in civil engineering.

3 hrs., or an equivalent, both semesters. 3 or 6 units.

## BOTANY.

PROFESSOR THORNBUR, MR. BROWN.

The courses which follow, revised for 1910-1911, are calculated to articulate with the work done in biology in the average western high school.

The Desert Botanical Laboratory of the Carnegie Institution of Washington, D. C., is located on the mountain just west of Tucson. In this laboratory, the southwest with its unique and, as yet, little investigated flora, gains what is destined to be one of the important centers of active, scientific research. The research facilities of the laboratory are all that could be desired, and the investigations upon the desert flora will appeal to students of botany from all quarters. In the light of the above, the importance of the Desert Botanical Laboratory to the University of Arizona and especially to this department will be apparent.

### 1. Elementary Botany.

MR. BROWN.

This course presents a general view of the four great groups of plants. It includes the morphology of types and their genetic relations. A required course for further botany. Texts: Bergen and Davis, *Principles of Botany*; Coulter, *Plant Studies*.

2 hrs. and 6 hrs. of laboratory work, first semester. T TH, 1-2; M W, 1-3, T TH, 2-3. 4 units.

### 2. Plant Histology.

MR. BROWN.

Lectures on microscopy, botanical microtechnique, the use of the camera lucida, the photographic camera. In the laboratory the greater part of the semester is given over to the use of the various chemical reagents and stains in the preparation of microscope slides. This course is given for those who intend to teach botany

and for those who are preparing to take advanced courses in this department. Text: Chamberlain, *Methods in Plant Histology*. Prerequisite, Botany 1

1 hr. of lecture and 7 hrs. of laboratory work, second semester. M, 1-2; M 2-3, T W TH, 1-3. 4 units.

**3. Plant Physiology.** MR. BROWN.

An elementary course in the life processes of plants. The laboratory work consists of an investigation of the properties of protoplasm; the relations of plants to mechanical forces; the influence of chemicals upon plants; the relation of plants to water, gravitation, light, respiration, growth, and movement. The laboratory, which is newly equipped, is situated in the center of a region most interesting to the physiologist. Text: MacDougal, *Textbook of Plant Physiology*. Prerequisite, Botany 1.

1 hr. of lecture and 7 hrs. of laboratory work, first semester. M, 1-2, M, 2-3, T W TH, 1-3. 4 units.

**\*4. Taxonomy.** MR. BROWN.

A course consisting of the analysis of plants in the field. During the semester several excursions will be made to the mesas, mountains and canyons. This course is intended not only for students who expect to continue the study of botany, but also for those who desire to know something of the desert flora. Text: Coulter and Nelson, *A New Manual of Rocky Mountain Botany*. Open to all college students.

1 hr. of lecture and 7 hrs. laboratory work, second semester. W, 2-3, TH, 2-4, 1-5. 4 units.

**\*5. Geographic Botany.** MR. BROWN.

Plant distribution over the surface of the earth together with the reasons for such distribution. The

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\*Omitted 1909-10.

general aspect of the vegetation characteristic of the hygrophytic forest, the tropophytic forest, the sclerophyll forest, the savannah, the steppe, the desert, the tundra, etc. The student is expected to do a considerable amount of reading in addition to the class-room and field work. The lectures will frequently be illustrated. No laboratory work. Prerequisite, Botany 4.

4 hrs., first semester; M T W T H, 4-5. 4 units.

**\*6. General Morphology of Algae and Fungi. MR. BROWN.**

Open to college students who have completed courses 1 and 2. Consult the instructor before registering. Prerequisites, Botany 1, 2.

Hours to be determined. 4 units.

**\*7. General Morphology of Bryophytes and Pteridophytes.**

4 units.

**\*8. General Morphology of Spermatophytes.**

4 units.

**\*9. The History of Botany.**

A lecture course dealing with (a) Early descriptive botanists. (b) The period of artificial systems: Caesalpino, Jung, Morison, Ray, Tournefort, Linnaeus. (c) The period of natural systems: Jussieu, Gartner, the De Candolle, Robert Brown, Endlicher, Lindley. (d) The beginning of modern botany. (e) Morphology: Goethe's Doctrine of Metamorphosis; Schimper and the spiral theory; Alexander Braun; Schleiden and the cell; Nageli, DeBarry, Hofmeister, Von Mohl, Treviranus, etc. (f) Physiology: Dutrochet, Liebig, Von Mohl, Sachs. (g) Phytogeography: Humboldt,

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\*Offered 1910-1911.

Meyer, Unger, De Candolle, Kerner, Darwin. (h) Botany and botanists of today. Prerequisites, Botany 1, 2, 3, 4. 4 units.

### CHEMISTRY.

PROFESSOR GUILD, ASSISTANT PROFESSOR BENNER AND  
MR. CALLAWAY.

The instruction in chemistry has two main objects in view: first, to promote general culture; and second, to introduce students to technical work, especially in mining. The first two years' work in general chemistry, qualitative and quantitative analysis, places the student in a position to take up advantageously the study of mining, agricultural chemistry or metallurgy.

#### 1, 2. General Chemistry and Qualitative Analysis.

PROF. GUILD, ASST. PROF. BENNER, MR. CALLAWAY.

Lectures and recitations illustrating the chemical properties of the elements and their compounds. Text-books: Newth, *Inorganic Chemistry*, Elliot and Storer, *Qualitative Analysis*; and various reference books. Open to all students who have taken courses amounting to one year each in preparatory chemistry and physics.

2 hrs., and two 3-hr. laboratory periods, both semesters, T TH, 10, TH F, 1-4. 8 units.

#### 3. Quantitative Analysis.

ASSISTANT PROFESSOR BENNER.

Laboratory practice, with lectures and recitations; the work will be chiefly in gravimetric methods of analysis. Open to all students who have taken Chemistry 2.

4 hrs., or an equivalent, first semester, M T W, 1-4. 4 units.

**4. Volumetric Analysis.**

ASSISTANT PROFESSOR BENNER.

A continuation of the work in Chemistry 3, special attention being given to the methods of assaying employed in the West.

4 hrs., or an equivalent, second semester. 2 units if discontinued March 15th; otherwise, 4 units.

**5, 6. Special Quantitative Analysis.**

ASSISTANT PROFESSOR BENNER.

The analysis of water, gases, oils, minerals. Open to students who have taken Chemistry 4.

4 hrs., or an equivalent, both semesters. 8 units.

**\*7, 8. Organic Chemistry.** PROFESSOR GUILD.

Lectures on the carbon compounds; laboratory work in organic analysis and the preparation of organic compounds; vapor density and molecular weight determination. Open to students who have taken Chemistry 3, 4.

4 hrs., or an equivalent, both semesters. 8 units.

**9. Synthetic Chemistry.** PROFESSOR GUILD.

The preparation of pure chemical compounds from the crude mineral products. Open to students who have taken Chemistry 4.

2 hrs., or an equivalent, first semester. 2 units.

**10. Physical Chemistry.** PROFESSOR GUILD.

Lectures. Historical introduction leading up to a discussion of modern chemical theories. Open to students who have taken Chemistry 3.

4 hrs., second semester. 2 units.

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\*Omitted 1909-1910.

**\*11, 12. Chemistry of the Rare Elements.**

ASSISTANT PROFESSOR BENNER.

The analysis and synthesis of uranium, molybdenum tungsten, vanadium and cerium compounds. Open to students who have taken Chemistry 6, 9.

4 hrs., or an equivalent, both semesters. 8 units.

**CIVIL ENGINEERING.**

PROFESSOR WATERBURY, MR. BLADES.

The courses in this department have been arranged with special reference to the engineering development of the Southwest. Stress will be laid on surveying, railroad and structural work, and irrigation engineering. The design throughout the courses is to give the student a thorough and practical knowledge of the essential principles of his profession, and to teach the technical practice of the times, so far as possible, without sacrificing in other directions.

**1, 2. Surveying.**

PROFESSOR WATERBURY AND MR. BLADES.

Use and care of surveying instruments, United States system of land surveys, city surveys, topographical and hydrographical surveying, mine surveying, and earthwork computations. Lectures, recitations, drawing, and fieldwork. Textbook: Johnson, *Surveying*. Open to students who have taken trigonometry, and who have taken or are taking Mechanic Arts, 1.

4 hrs., both semesters, M W F, 11 (lectures), and S, 8-12 (fieldwork). 8 units.

**\*3. Geodesy.**

PROFESSOR WATERBURY

Size and shape of the earth; latitude, longitude and azimuth determinations; base line apparatus; triangu-

lation; and trigonometric levelling. Open to students who have taken Civil Engineering 1, 2, and Astronomy 2.

1 hr., first semester. 1 unit.

**\*6. Concrete and Masonry Construction.**

PROFESSOR WATERBURY.

The theory and practice in reinforced concrete construction. Foundations on land and in water, cofferdams, cribs, caissons, piers, and abutments, retaining walls, dams, and arches. Open to students who have taken Civil Engineering 14.

3 hrs., and one 3-hour laboratory and drafting period, second semester. 4 units

**\*7. Steel Mill Buildings.** PROFESSOR WATERBURY.

Graphical and analytical computation of stresses in roof and bridge trusses; a study of the details of structural steel designing; complete design with drawings, estimate of weights, and estimate of cost for a steel mill building. Text-book: Ketchum, *Steel Mill Buildings*. Open to students who have taken Civil Engineering 14.

2 hrs., and two 3-hour drafting periods, first semester. 4 units.

**\*8. Bridge Design.** PROFESSOR WATERBURY.

Computation of stresses due to moving loads upon various points of bridge structures; a detailed study of bridge designs and bridge erections; complete design with drawings, estimate of weights, and estimate of cost of a steel bridge. Text-book: Ketchum, *Design of Highway Bridges*. Open to students who have taken Civil Engineering 7.

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\*Omitted 1909-1910.

2 hrs., and two 3-hour drafting periods, second semester. 4 units.

**9. Railroad Engineering.** PROFESSOR WATERBURY.

Preliminary and location surveys; simple and easement curves, turnouts and switches; principles of economic location as based upon cost of construction, operating expenses, alignment, and grades; maintenance of way. The fieldwork consists of the surveys for a railroad of sufficient length to secure familiarity with the methods of actual practice. Each student makes a complete set of notes, maps, profiles, calculations and estimates of cost. Text-book: Allen, *Railroad Curves and Earthworks*. Open to students who have taken Civil Engineering 1, 2.

3 hrs., and one 4-hour field period, T TH F 8, and M 1-5, first semester. 4 units.

**11. Hydraulics.** PROFESSOR WATERBURY.

Velocity and discharge from orifices, weirs, tubes, and pipes; flow in sewers, ditches, canals and rivers; measurement of water power; water wheels of various types. Text-book: Merriman, *Hydraulics*. Open to students who have taken Civil Engineering 1, 2 and Mathematics 4.

4 hrs., first semester; T W TH F 9. 4 units.

**\*13. Principles of Irrigation.** PROFESSOR WATERBURY.

A study of the present condition of irrigation development in the United States; irrigation legislation; methods of establishing rights to water, a brief reference to the engineering principles relating to the construction and maintenance of canals and reservoirs

and the various means of diverting and measuring water for use in irrigation. Text-book: Wilson, *Irrigation Engineering*. Open to students who have taken Civil Engineering 1, 2, 11, 14. 3 hrs., and one 3-hour laboratory and drafting period, first semester. 4 units.

#### 14. Materials of Construction.

PROFESSOR WATERBURY AND MR. BLADES.

The properties and uses of stone, brick, lime, cement, concrete, timber, iron, and steel. The computation of stresses in prisms, beams, columns, and shafts. Lectures, recitations and laboratory work. Text-book: Merriman, *Mechanics of Materials*. Open to students who have taken or who are taking Mathematics 5, 6.

3 hrs., and one 3-hour laboratory period, second semester. T W TH, 9, and M, 1-4. 4 units.

#### 15. Contracts and Specifications. PROF. WATERBURY

The essential elements of a contract; items included in various kinds of engineering contracts and specifications; the preparations of a complete set of specifications and a contract. Text-book: Johnson, *Engineering Contracts and Specifications*. Open to all college students.

2 hrs., first semester; M W, 8. 2 units.

#### \*17. Water Supplies. PROFESSOR WATERBURY.

Methods of investigation of available supplies of water for public use; methods of purification of water; and a study of the design of water systems. Text-book: Turneure and Russell, *Public Water Supplies*. Open to students who have taken or who are taking Civil Engineering 11. 3 hrs., first semester. 3 units.

#### \*18. Sewage PROFESSOR WATERBURY.

Methods of sewage purification; a study of sewage disposal plants; and a study of the design of sewer sys-

tems. Text: Folwell, *Sewage*. Prerequisite, Civil Engineering 11. 3 hrs., second semester. 3 units.

### **ECONOMICS.**

PROFESSOR CHANDLER.

**1. Introduction to Economic Theory.** PROF. CHANDLER.

A study of the main principles which underlie the science, with special reference to illustrations of their workings in the growth of industry and commerce in England and the United States. Although the work of this course is essentially theoretical, no opportunity is lost to supplement the study with practical illustrations drawn from the business activities of today. Seagers, *Introduction to Economics* is used as the basic text. Open to all college students.

3 hrs., first semester, M W F, 10. 3 units.

**2. Industrial and Tariff History of the United States.**

PROFESSOR CHANDLER.

A study of the rise of the factory system in the United States, and the origin and development of the leading American industries. The history of the tariff from 1789 to 1909 and its influence upon the development of manufacturing and the growth of trusts, as well as its relation to wages, fixed salaries, and the increased cost of living. Tariff reform. Open to all college students who have had Economics 1.

3 hrs., second semester, M W F, 10. 3 units.

**3. Corporation Finance and the Trust Problem.**

PROFESSOR CHANDLER.

Twentieth century methods of organizing and carrying on business. Problems attending the expansion of corporate enterprise and the growth of trusts. Legal status of the corporation; relations of corporation to business supremacy; methods of promotion and capitali-

zation; monopoly price and methods; effect of trust development upon prices, wages and profits; the struggle of the independent entrepreneur; relation of government to industrial and commercial enterprise; Federal and state regulation; the function of the public service commissions. Open to all college students who have had one year of economics.

2 hrs., first semester, T TH, 11. 2 units.

#### 4. Transportation and Commerce.

PROFESSOR CHANDLER.

Three phases of transportation are studied:

1. The rise of the American railway system, and its past and present relation to the development of agriculture, manufacturing, and other industries.

2. The present American railway system—its business organization, methods of combination and financial operations.

3. Relation of the railroad to the government and the public; rights of the shipper and the investor in railway securities; the Interstate Commerce Commission and Federal control of commerce; proposed reforms in state and Federal regulation, including a study of government ownership in Europe and Australia, with a discussion of its practical value if applied to American conditions. Open to all college students who have had Economics 1.

2 hrs., second semester, T TH, 11. 2 units.

#### \*5. Money, Banking and Finance.

PROFESSOR CHANDLER.

The functions of money and its relation to credit institutions; the monetary system of the United States; the theory and history of banking; function of the sav-

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\*Omitted 1909-1910

ings bank, the trust company, the clearing house, etc.; history of American finance, and financial crises in their relation to our present currency and banking systems; the examination of the principal banking systems of the world with a view to finding ideas which, if applied to American conditions, would render our system more nearly conformable to our growing financial and commercial needs. Open to all college students who have had one year of economics.

3 hrs., first semester. 3 units.

**\*6. The Labor Movement.** PROFESSOR CHANDLER.

The history and growth of labor organizations; economic and social conditions of the working classes in Europe and the United States; organized labor vs. organized capital; strikes and lockouts; the closed shop; the secondary boycott; collective bargaining; the state in relation to labor; the use of the injunction; compulsory arbitration; labor legislation; law of conspiracy and recent court decisions.

3 hrs., second semester. 3 units.

**\*7. Introduction to the Study of Society.**

PROFESSOR CHANDLER.

A study of the underlying principles of social organization and development. History of the science up to date. The application of social principles to the most important problems which confront society in Europe and America, especially those problems attending the rapid development of cities and congested industrial centers.

2 hrs., first semester. T TH, 2. 2 units.

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\*Omitted 1909-1910.

**\*8. Socialism and Social Reform.**

PROFESSOR CHANDLER.

History of the rise and development of modern socialism; scientific vs. Utopian socialism; present status of socialism as a practical and political reform movement; state socialism; the Fabians, etc.; other social-industrial reforms; profit sharing; land nationalization; labor co-partnership, etc.

2 hrs., second semester. 2 units.

**ENGLISH.**

PROFESSOR BATES, MISS LUTRELL, MR. WALDRON.

The purpose of the literary courses outlined below is to give a general knowledge of English literature from its beginnings to the present time, chief stress being laid upon the study of representative authors, but with broader literary movements constantly in mind. The courses in composition aim to develop accurate thought and clear, vigorous expression; opportunity for work in advanced composition is afforded in connection with the courses in literature.

**1. Composition.**

MR. WALDRON.

Narration and description; lectures and the study of Nettleton, *Specimens of the Short Story*; daily and weekly themes. Prescribed for all freshmen.

3 hrs., first semester, M W F, 10. 3 units.

**2. Composition.**

MR. WALDRON.

Exposition and argumentation; study of Perry, *Argumentation*, class debates, impromptu speeches, and frequent themes. Prescribed for all freshmen.

3 hrs., second semester, M W F, 10. 3 units.

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\*Omitted 1909-1910.

**3, 4. Nineteenth Century Prose. PROFESSOR BATES.**

From the publication of the Lyrical Ballads to the death of Ruskin, 1798-1899. The following writers are studied: Irving, Poe, Hawthorne, Emerson, Thoreau, Macaulay, Carlyle, Ruskin, Arnold, and Stevenson. Weekly papers on assigned topics; lectures and discussions. Primarily for freshmen.

2 hrs., both semesters, T TH, 10. 4 units.

**5, 6. Elizabethan Drama. PROFESSOR BATES.**

Attention is given first to the development of the Elizabethan drama from the Miracle Plays, Moralities, and Interludes; the Senecan influence is studied, and the work of Lyly, Greene, Peele, Kyd, and Marlowe briefly considered; then the bulk of the year is given to a close detailed study of the leading plays of Shakespeare, followed by a cursory treatment of the post-Shakespearian drama, at least one play being read from each of the following writers: Jonson, Beaumont and Fletcher, Heywood, Webster, Middleton, Massinger and Ford. Lectures and discussions and a thesis of not less than 2,000 words.

3 hrs., both semesters. T TH F, 11. 6 units.

**\*9, 10. Poetry Prior to the Nineteenth Century.**

PROFESSOR BATES.

This course affords a brief introductory view of Anglo Saxon literature (in translation), a discussion of medieval romances and ballads, and a study of Elizabethan lyrics, Spenser, Milton, the Augustans, and the forerunners of romanticism in the eighteenth century. Weekly papers on assigned topics; lectures and discussions.

3 hrs., both semesters, M W F, 8. 6 units.

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\*Omitted 1909-1910.

**11, 12. Poetry of the Nineteenth Century.**

PROFESSOR BATES.

This course gives opportunity for the study of the following writers: Wordsworth, Coleridge, Scott, Byron, Shelley, Keats, Landor, Tennyson, Mrs. Browning, Robert Browning, Arnold, Rossetti, Morris, and Swinburne. . Weekly papers on assigned topics, lectures, and discussions.

2 hrs., both semesters, M W 8. 4 units.

**13, 14. Chaucer.**

MISS LUTRELL.

In this course a large part of the *Canterbury Tales* is read, the *Prologue to the Legende of Gode Wommen*, and some of the minor poems. The course is purely literary and a knowledge of Anglo-Saxon is not required.

3 hrs., both semesters; T TH F, 8. 6 units.

**15, 16. Nineteenth Century Fiction.** PROFESSOR BATES.

Lectures upon the lives and general position of the following authors: Austen, Scott, Dickens, Thackeray, Emily Bronte, Charlotte Bronte, George Eliot, Reade, Meredith, Hardy, and Stevenson. One work is read from each of these writers, and its intellectual substance, literary style, plot, characterization, and atmosphere are discussed.

2 hrs., both semesters; M W, 10. 4 units.

**17, 18. Contemporary Literature.** PROFESSOR BATES

The aim of this course is to afford such a study of British and American literature in the last quarter-century as will enable the student to form a clear estimate of present-day tendencies. It covers the decadent and symbolic schools of British poetry, the Irish movement, contemporary American poetry, the romantic and realistic schools of fiction, and the revival of the drama,

with especial reference to the influence of Ibsen. Readings assigned in the poetry of James Thomson, Francis Thompson, Lang, Symons, Henley, Johnson, Yeats, Hovey, and Carman; in the fiction of Kipling, Hewlett, Gissing, Locke, and Herrick.; in the dramas of Ibsen, Pinero, Jones, Shaw, Wilde, and Phillips. Lectures upon these and other authors.

2 hrs., both semesters, T TH, 9. 4 units.

### 19, 20. Principles of Literary Criticism.

PROFESSOR BATES.

For graduate students and seniors obtaining special permission. The course is designed both to develop ability in research work, and to enable the student from his examination of critical theory to form satisfactory canons of taste. It is conducted as a seminar with reports and theses. In the first semester the following authors are studied: Plato, Aristotle, Sidney, Dryden, Addison, Pope, Johnson, and Burke. The second semester is devoted to writers of the nineteenth century, especially Wordsworth, Coleridge, Shelley, Hazlitt, Poe, Arnold, Pater, and various contemporary critics.

Hours and credits to be arranged with the instructor.

### FRENCH.

PROFESSOR TURRELL, DOCTOR ALDRICH.

#### 1, 2. Elementary French. DOCTOR ALDRICH.

First semester: Fraser and Squair, *French Grammar*, (Part I), Aldrich and Foster, *French Reader*. Second semester: Reading of Daudet, *La Belle Nivernaise*, Labiche and Martin, *La Poudre aux Yeux*, Halevy, *L'Abbe Constantin*. Composition and dictation. with drill on the irregular verbs.

5 hrs., both semesters, M T W TH F, 2:40. 8 units.

**3, 4. Advanced French.**

PROFESSOR TURRELL.

First semester: Fraser and Squair, *French Grammar* (Part II), Merimée, *Colomba* or *Carmen*, Lamartine, *Graziella*, Sand, *La Mare au Diable* or *La Petite Fadette*.  
 Second semester: Selected reading: including Canfield, *French Lyrics*, Victor Hugo, *Les Miserables* (abridged).

5 hrs., both semesters; M T W T H F, 1. 8 units.

**5. French Literature to the Nineteenth Century.**

PROFESSOR TURRELL.

The classical French dramatists. Reading of plays of Corneille, Racine and Moliere. Lectures on the eighteenth century, Voltaire, Rousseau, Diderot, etc. Beaumarchais, *Le Barbier de Seville*. Library readings.

3 hrs., first semester. 3 units.

**6. French Literature in the Nineteenth Century.**

PROFESSOR TURRELL.

Particular study of the drama. The Romanticists. Victor Hugo, Musset, Scribe, Augier, etc. Recent literary movements in France. Pailleron, Dumas, Rostand, Zola, Sardou, Hervieu, Maeterlinck, etc.

3 hrs., second semester. 3 units.

**7, 8. Advanced Composition.**

PROFESSOR TURRELL.

Vreeland and Koren, *French Syntax and Composition*, Kron, *French Daily Life*, etc. Original essays and reports in French.

2 hrs., both semesters. 4 units.

Courses 5, 6, 7, 8 may be taken together or separately, but must be preceded by courses 1, 2, 3, 4.

**GEOLOGY.**

PROFESSOR TOLMAN AND MR. CHAPIN.

The earlier courses in geology are constructed not only to introduce the student to general and applied

geology, but with special reference to the development of the observational faculties, and training in inductive and deductive reasoning so that the student may discover for himself the causes for each phenomenon observed. The more advanced courses are technical and cover the essentials of geology for a mining engineer. The courses in geological mapping allow the student to take advantage of the opportunities at hand for field work, and include reconnaissance and detailed field mapping and underground geological mapping. Special field work can be undertaken by advanced students under the direction of the department.

### 1, 2. General Geology.

PROFESSOR TOLMAN.

Geological processes, their causes and effects. The atmosphere, surface and underground water, the ocean and the ice and snow as geological agents. Earth movements; mountain and continent building; vulcanism. Rocks, their origin and alterations. Historical geology, reviewing the physical history of the earth and correlated life progress.

The laboratory work covers the reading and interpretation of topographical and geological maps, the fundamentals of geological mapping, structural problems, and stereogrammatic and graphic methods for the solution of problems in faulting. Short field trips are taken in the second semester. Open to students who have taken or who are taking Mineralogy 1, 2.

3 hrs., and one laboratory period, both semesters,  
M T W TH, 8. 8 units.

### 3. Economic Geology—Non-Metallic Products.

PROFESSOR TOLMAN.

Statistics, production, utilization, value, occurrence, genesis and methods of investigation of iron and manganese and the non-metallic products, viz.: coal, gas, bitumen, etc.; building stones, clays, cement materials, sands, etc.; borax, phosphates, fluorspar, gypsum, graphite, mica, asbestos, mineral paints, etc.; salines, mineral waters, artesian flows, and investigation of underground water flow, etc.; precious stones.

3 hrs., first semester. 3 units.

### 4. Economic Geology—Metallic Products.

PROFESSOR TOLMAN.

Detailed study of ore deposits. Prerequisite, Geology 1, 2.

3 hrs., second semester. 3 units.

### 5, 6. Field Geology.

PROFESSOR TOLMAN AND MR. CHAPIN.

Construction of maps and sections. United States Geological Survey methods of geological mapping. Geological mine mapping and stereography. Two detailed geological maps are required of each student, one of a portion of the Tucson mountains (lava flows) and one of a district in the Rincon mountains (faulted and folded sedimentary rocks), a sketch reconnaissance map, and a geological map of mine workings. Open to students who have taken or are taking Geology 3, 4 and Mineralogy 3, 4.

All day Saturdays, or an equivalent, in the field, both semesters. 8 units.

**\*7. Type Fossils.**

MR. CHAPIN.

Identification of the type fossils, especially of the Paleozoic.

2 hrs., first semester. 2 units.

GRADUATE WORK. Advanced work in economic and field geology will be arranged for those working for the Master's Degree or that of Engineer of Mines.

**GERMAN.**

PROFESSOR TURRELL, MISS ROBERTS.

**1, 2. Elementary German.**

MISS ROBERTS.

First semester: Bacon, *German Grammar*, complete. Second Semester: Reading of Storm, *Immensee*, von Hillern, *Hoher als die Kirche*, Manley and Allen, *Four German Comedies*. Composition, dictation and continued grammar drill.

5 hrs., both semesters, M T W TH F, 2:40. 8 units.

**3, 4. Advanced German.**

MISS ROBERTS.

First semester: Pope, *German Composition*, with review of Syntax. Reading of Meyer-Foerster, *Karl Heinrich*, Heine, poems and *Die Harzreise*. Second semester: Composition continued. Lessing, *Minna von Barnhelm*, Schiller, *Wilhelm Tell*, etc.

5 hrs., both semesters; M T W TH F, 1:50. 8 units.

**5, 6. Lessing, Schiller, and Goethe.**

PROFESSOR TURRELL.

First semester: Reading and interpretation of Lessing, *Emilia Galotti*, *Nathan der Weise*, Schiller, *Maria Stuart*, *Wallenstein*. Accompanied by a brief outline of German literature to the nineteenth century.

Second semester: Goethe, *Hermann und Dorothea*, *Egmont*, *Die Italienische Reise*, *Faust*, Part I.

3 hrs., both semesters. 6 units.

## 7, 8. German Literature in the Nineteenth Century.

PROFESSOR TURRELL.

First semester: The Romanticists and their successors. Class reading of Kleist, *Der Prinz von Homburg*, Grillparzer, *Der Traum ein Leben*, *Die Ahnfrau*, etc. Second semester: The rise of Naturalism and Symbolism. Wildenbruch, *Harold*, Fulda, *Der Talisman*, Sudermann, *Johannes*, Hauptmann, *Die versunkene Glocke*. Lectures and library readings.

2 hrs., both semesters. 4 units.

Courses 5, 6, 7, 8 may be taken together or separately, but must be preceded by Courses 1, 2, 3, 4.

## GREEK.

MRS. NEWSOM.

### \*1, 2. Beginner's Course.

MRS. NEWSOM.

The work done is represented by White, *First Greek Book*; Goodwin, *Greek Grammar*; and Xenophon, *Anabasis* (first four books).

5 hrs., both semesters. 8 units.

### 3, 4. Homer and Plato.

MRS. NEWSOM.

Homer, *Iliad* (first four books); Plato, *Apology* and *Crito*; and selections from Lysias.

5 hrs., both semesters, M T W TH F, 9:50.— 8 units.

## HISTORY.

PRESIDENT BABCOCK, ASSISTANT PROFESSOR CHANDLER.

In the work in history emphasis is placed on the social and political development, the relation of cause and effect, and the unity of history. The laboratory

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\*Omitted 1909-1910.

method is used whenever possible and individual work insisted on.

**\*1, 2. Political and Constitutional History of England.**

ASSISTANT PROFESSOR CHANDLER.

This course will cover the political history from Anglo-Saxon times to the battle of Waterloo. The development of the English constitution and the origin of other political and legal institutions contributed by England to modern civilization will be studied. Gardiner, *Students' History of England* is used as the general text, with Montague, *Constitutional History* for collateral study. Assigned readings, preparation of frequent reports and consultation of original sources where practicable. Open to all college students.

4 hrs., both semesters. 8 units.

**\*3, 4. American Colonial History.**

PRESIDENT BABCOCK.

A detailed study of the American colonies under Great Britain, and of the United States to the adoption of the Constitution. Lectures, assigned reading, and reports. Open to students who have taken History 1, 2.

3 hrs., both semesters. 6 units.

**\*5, 6. Constitutional History of the United States.**

PRESIDENT BABCOCK.

A detailed study of the formation of the Union and of the political and constitutional history of the United States down to 1856, based on letters and speeches of American statesmen, public documents and special histories. Open to students who have taken History 1, 2.

3 hrs., both semesters, T TH S, 8. 6 units.

**\*7, 8. Great Movements in History.**

PRESIDENT BABCOCK.

Lectures, with readings, on the great forces of history and the forms of their manifestation—migrations, religions, political and economic revolutions, etc.

2 hrs., both semesters, M W, 11. 4 units.

**9. The French Revolution and the Napoleonic Period.**

ASSISTANT PROFESSOR CHANDLER.

The causes, events and results of the French Revolution, and the spread of reform under Napoleon. The study of the revolution will be prefaced by a review of the state of European civilization in the middle of the eighteenth century and the influence of the French and English schools of literature, philosophy and economics as factors in the political and economic revolutions. Open to all college students.

3 hrs., first semester, M W F, 11. 3 units.

**10. European History Since the Congress of Vienna.**

ASSISTANT PROFESSOR CHANDLER.

A study of the liberal and reform movements, social, political, economic and intellectual, up to the present time; the evolution of constitutional government; the various movements towards national unity; the revolts of 1820, 1830 and 1848; the Eastern question; the Franco-Prussian war; and the rise of Germany to a commanding position in world commerce and politics; English reform bills of 1832 and 1867, and other political, religious and social-industrial reforms. Open to all college students.

3 hrs., second semester, M W F, 11. 3 units.

**LATIN.**

MRS. NEWSOM.

The courses below are open to students who have completed the first three years of Latin in the sub-collegiate department, or an equivalent. Constant thorough drills are given in technical grammar and prose composition. In reading, the matter is subjected to grammatical, metrical, rhetorical and historical explanation. The study of the text is made the means of mental discipline, of developing the faculties of observation and critical judgment, and of acquiring habits of thoroughness and accuracy.

**Virgil, Livy, and Cicero.**

MRS. NEWSOM.

1, 2. Virgil, *Æneid*, Books V and VI; Livy, Selections; Cicero, *de Senectute*, *de Amicitia*. Exercises in prose composition.

4 hrs., both semesters. 8 units.

**3, 4. Tacitus and Horace.**

MRS. NEWSOM.

Tacitus, *Germania* and *Agricola*, Selections from Histories; Horace, *Odes*.

3 hrs., both semesters. 6 units.

**MATHEMATICS.**

PROFESSOR E. M. BLAKE, ASSISTANT PROFESSOR MEDCRAFT.

**1. College Algebra.** ASSISTANT PROFESSOR MEDCRAFT.

One-fifth of the time of the course in college algebra is devoted to graphical methods. Prescribed for all freshmen in engineering courses.

4 hrs., and a 2-hr. laboratory period, first semester,  
M W TH F, 9, T, 8-10. 5 units.

## 2. Analytical Geometry.

ASSISTANT PROFESSOR MEDCRAFT.

The fundamental methods of analytical geometry; the straight line and circle; the properties of the conic sections; problems in loci; graphical solutions of equations. Prescribed for all freshmen in engineering courses.

4 hrs., and a 2-hr. laboratory period, second semester, M W TH F, 9, T, 8-10. 5 units.

## 3. Differential Calculus.

PROFESSOR BLAKE.

The fundamental principles and formulae of the differential calculus, with their applications. Prescribed for sophomores in all engineering courses.

3 hrs., first semester, M W F, 9. 3 units.

## 4. Integral Calculus.

PROFESSOR BLAKE.

The fundamental principles and formulae of integral calculus, with their applications. Prerequisite, Mathematics 3. Prescribed for sophomores in all engineering courses.

3 hrs., second semester, M W F, 9. 3 units.

## 5, 6. Analytical Mechanics.

PROFESSOR BLAKE.

The mathematical treatment of the fundamental principles of dynamics and statics, illustrated and applied. Prerequisites, Mathematics 4, and Physics 1, 2.

4 hrs., and a 2-hr. laboratory period, first semester, and 4 hrs., second semester, M T W TH, 10. 9 units.

## MECHANIC ARTS.

PROFESSOR HENLEY, MR. ISAACSON.

The courses in Mechanic Arts comprise the elements of shop work and drawing. The work consists of lectures, recitations and drawing, tool and machine work. The courses are designed with special regard for the needs of the students in engineering, an effort being made to

familiarize the student with the ordinary methods in shop work, a knowledge of which is valuable to every engineer, rather than to develop the skill of the mechanic.

**1. Mechanical Drawing.** PROFESSOR HENLEY.

Elements of mechanical drawing, including lettering, tracing, and blue printing. The subject is treated in a purely mechanical way, the object being to enable the student to learn to make and read ordinary working drawings, and to give him some knowledge of ordinary drafting room practice.

2 laboratory periods, first semester, T, 1-4, S, 9-12  
2 units.

**2. Descriptive Geometry.** PROFESSOR HENLEY

Elements of descriptive geometry, including problems in warped surfaces and intersection of solids.

2 lecture and laboratory periods, second semester.  
T 1-4, S, 9-12. 2 units.

**3. Wood Shop.** PROFESSOR HENLEY.

Bench and machine work; elements of pattern and foundry work.

2 periods, first semester, M, 1 (lecture), 2-4 (shop),  
W, 1-4, (shop). 2 units.

**4. Forge Shop.** PROFESSOR HENLEY.

Forge work in iron and steel; tempering, case-hardening and annealing. A study of those characteristics of iron and steel which affect their working in the shop.

2 periods, second semester, M, 1 (lecture), 2-4 (shop),  
W, 1-4 (shop),. 2 units.

**5, 6. Machine Shop.** MR. ISAACSON.

This course includes the elements of machine shop practice, and the erection and care of machinery. The

student is given work on the drill press, shaper, lathe, and planer, as well as at the bench and on the erecting floor. Only the ordinary classes of work are taken up, the object being to make it as much as possible, a general engineering course. Open to students who have had courses 1, 3, 4, or an equivalent.

2 periods, both semesters, TH, 1 (lecture), (shop), F, 1-4. 4 units.

**7, 8. Advanced Machine Shop Practice.** MR. ISAACSON.

This course is designed for students in mechanical engineering, or others who require a more thorough course than is given in courses 1, 3, 4, 5, 6. It continues the work of these courses and in addition takes up the various standard manufacturing methods. The work consists of shop work, lectures and reading, the equivalent of two half-days a week, both semesters, the hours to be arranged with the instructor. 4 units.

**MECHANICAL ENGINEERING.**

PROFESSOR BLAKE, PROFESSOR HENLEY AND MR. ISAACSON

**1. Heat Engines.**

PROFESSOR BLAKE AND MR. ISAACSON.

Principles of thermodynamics as applied to steam and internal combustion engines. Study of the general structural features and methods of operating the more important types of boilers, and steam and gasoline engines.

2 hrs. and a 3-hrs. laboratory period, first semester, T TH, 8, M, 1-4. 3 units.

**2. Dynamo-Electric Machinery.**

PROFESSOR BLAKE AND PROFESSOR HENLEY.

Theory underlying the generation, transmission, and utilization of electric currents. Description of the

more important types of generators and motors. Pre-requisite, Mechanical Engineering 1.

2 hrs., and a 3-hr. drafting period, second semester, T TH, 8, M, 1-4. 3 units.

**3, 4. Kinematics of Machinery and Elements of Machine Design.** PROFESSOR BLAKE.

Theory and design of linkages, gears, cams, screws, and other machine elements.

1 hr. and two 2-hr. drafting periods, both semesters. 6 units.

**5, 6. Mechanical Laboratory.** PROFESSOR BLAKE.

Operation, inspection, and testing of boilers, steam and gasoline engines, compressed air machinery and pumps.

1 hr., and two 3-hr. laboratory periods, both semesters. 6 units.

**7, 8. Machine Design.** PROFESSOR BLAKE.

Exercises in the designing of complete machines, such as a steam or gas engine, a pump, a compressor, a mine hoist, or a locomotive.

1 hr., and one 2-hr. drafting period, both semesters, 4 units.

**9, 10. Power Plant Design and Economics.**

PROFESSOR BLAKE.

Study of machinery installations as to arrangement of parts, adaptability to intended work, and economy of first cost and operation. Exercises in writing specifications and designs of such installations as the boiler plant and engines of an electric generating station, a pumping station for waterworks, an air compressing plant for a mine, or a stamp mill. As part of this course trips will be made to the mining districts of Ari-

zona and Sonora, usually one or two weeks in March or April.

1 hr. and two 2-hr. drafting periods, both semesters.  
6 units.

**\*11, 12. Alternating Currents and Electric Distribution.**

A general discussion of the theory of alternating currents; types of motors, generators and transformers, arrangement of circuits, line construction, long distance transmission.

3 hrs., both semesters: 6 units.

**METALLURGY.**

PROFESSOR GOODRICH.

**1. Introduction to Metallurgy. PROFESSOR GOODRICH.**

Physical properties of metals, alloys, thermal treatment of metals, thermal measurements, fuel, refractory materials, metallurgical processes, furnaces, thermochemistry, metallurgy of iron and steel. Seniors in Mining Engineering and Metallurgy. Lectures and recitations.

4 hrs. for 1 month, first semester. 1 unit.

**2. Fire Assaying. PROFESSOR GOODRICH.**

Fire assay for gold, silver and lead. Bullion assays.  
Prerequisite, Chemistry 3, 4.

15 hrs., or an equivalent, second semester (March, April, and May). M T W, 1-6 2 units.

**3. Metallurgy of Gold and Silver.**

PROFESSOR GOODRICH.

Stamp milling, chlorination, tube-milling, and filtering cyaniding, pan-amalgamation; Patio, and Tina

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\*Offered in 1910-1911, in charge of Mr. E. J. Ryan Instructor-elect in Mechanical and Electrical Engineering.

processes; hyposulphite leaching practice, etc. Lectures and recitations. Prerequisite, Metallurgy 1, 2.

4 hrs., first semester (except first month), T, 4, W TH, F, 8. 3 units.

#### **4. Metallurgy of Lead and Copper.**

PROFESSOR GOODRICH.

Sampling, receiving, purchasing, roasting; blast furnace methods, reverberatory furnace methods; pyritic smelting, converting, desilveration of base bullion, electrolytic refining, hydro-metallurgy of copper, etc. Lectures and recitations. Prerequisites, Metallurgy 1, 2, and 3.

4 hrs., second semester, T, 4, W F, 1, F, 8. 4 units.

#### **5A. Metallurgical Laboratory.** PROFESSOR GOODRICH.

Amalgamation, cyaniding, chlorination, hyposulphite lixiviation, etc., tests, together with mill work. This course runs parallel with Metallurgy 3. Lectures.

One weekly period, first semester. 1 unit.

#### **5B. Metallurgical Laboratory.**

Sampling, concentration, mill work. This course runs parallel with Metallurgy 7. Lectures.

One weekly period, first semester. 1 unit.

#### **6. Advanced Metallurgical Laboratory.**

PROFESSOR GOODRICH.

This course is a continuation of Metallurgy 5 (mill work), for such students as have completed Metallurgy 5, and who desire more practical experience in ore testing. New machinery is being constantly added to the mill, which becomes available for this course.

2 periods, second semester. 2 units.

**7. Ore Dressing.**

PROFESSOR GOODRICH.

Breaking, crushing, separating, concentrating, sampling; mill processes and management. Lectures and recitations. Prerequisites, Chemistry 3, 4, and Metallurgy 2.

3 hrs., first semester, M W F, 11. 3 units.

**\*8. Metallurgy of Rare Metals.** PROFESSOR GOODRICH.

Metallurgy of zinc, cadmium, nickel, mercury, bismuth, tin, antimony, cobalt, platinum, tungsten, molybdenum. Lectures and recitations. Prerequisites, Metallurgy 1, 2, and 3.

2 hrs., second semester. 2 units.

**9. Excursions.** See Mining Engineering 7, 8.**MINERALOGY.**

PROFESSOR GUILD.

The main object of the courses in mineralogy is to familiarize the student with facts and methods that will enable him to determine the character of an ore or mineral by observation of its physical properties and by the performance of a few simple tests with the blow-pipe, since in the field and mine recourse can not usually be had to a well equipped chemical laboratory.

**1, 2. General Mineralogy.**

PROFESSOR GUILD.

Lectures and recitations in crystallography and the classification and uses of minerals; laboratory work in blow-pipe analysis and determinative mineralogy; the study of a type collection of 600 minerals arranged and classified according to Dana. Text-books: Dana, *Text-book of Mineralogy*, and Brush, *Manual of Determinative Mineralogy and Blow-pipe Analysis*. Prerequisites, Chemistry 2, and Physics 2.

2 hrs., and two 3-hr. laboratory (blow-pipe) periods, first semester. 4 units (crystallography 2, blow-pipe 2). 3 hrs., or an equivalent, second semester, 3 units.

**3. Optical Mineralogy.** PROFESSOR GUILD.

With microscopic study of the rock-forming minerals. Prerequisites: Geology 2, and Mineralogy 2. 2 hrs., or an equivalent, first semester. 2 units.

**4. Petrography.** PROFESSOR GUILD.

The preparation of thin sections of rocks for microscopic study, and the study of a type selection of rocks. Prerequisite, Mineralogy 3.

2 hrs., or an equivalent, second semester. 2 units.

**5. Crystallography.**

The measurement, projection and drawing of crystals. Prerequisite, Mineralogy 1.

Either semester 2 or 4 units.

## **MINING ENGINEERING.**

PROFESSOR TOLMAN.

In this course attention is largely directed to the operations and economics of mining, and the laboratory and drafting work is so arranged that the student will have plans and designs which will be of value in the practice of the profession.

**1, 2. Lectures on Mining.** PROFESSOR TOLMAN.

Location of claims; mining laws of the important mining countries of the world; prospecting; excavations, tunnels, shafts, and methods of timbering; underhand, overhand, square sett, filling and caving methods of mining; pumping; ventilation; transportation; hoisting; mining machinery, its installation; and surface improvements of mines.

Methods for undeveloped properties compared with those for developed mines. Mine accounts, cost sheets, stope sheets, assay plans; methods of management; mine sampling and mine reporting.

2 hrs., both semesters. 4 units.

**3. 4. Laboratory in Mining.** PROFESSOR TOLMAN.

The study of designing of timbering, and mining constructions of all kinds, ore bins, heat-frames head-gear, dumping devices, etc.

One 3-hr. laboratory period, both semesters. 2 units.

**5. 6. Technical Mining Literature.**

PROFESSOR TOLMAN.

The summarizing of the current literature on mining, and arrangement of a card index of the same.

One 3-hr. laboratory period, both semesters. 2 units.

**7. Practical Mining.**

Before entering upon the work of the senior year, all students who are candidates for the degree of B.S., in Mining Engineering, must have spent at least four weeks in practical underground mining, or for the degree of B.S. in Metallurgy, four weeks in a metallurgical plant, or in underground mining, preferably the former. The fulfillment of this requirement must be evidenced by the certificate of the mine superintendent or foreman, and by notes and sketches of the processes observed, to be presented to the faculty of the School of Mines, and discussed with them.

**\*8. Summer School of Mine and Topographical Surveying.**

A 4-weeks course in the field during which detailed mine surveys will be carried out. The course will be given during the month of June, and in the northern

part of the Territory where the high elevation makes the summer climate delightful. Required of all students taking the degree of B. S. in Mining Engineering, after June, 1912, unless the equivalent of actual underground surveying is offered. This course should be taken preferably at the close of the sophomore year. Open to students who have taken Civil Engineering 1, 2.

#### **9. Field Excursions.**

In connection with the courses in mining engineering and metallurgy, trips will be made to mining districts in Arizona and Sonora, usually one or two weeks in March or April. These trips are required of all candidates for the degree of B. S. in Mining Engineering and in Metallurgy.

The purpose of these trips is to afford the student an opportunity for close study and inspection of mining and metallurgical plants, and of rock formations and of minerals of commercial value. The students are accompanied by members of the faculty, and every effort is made to make the trips of the greatest practical value. The visits are carefully scheduled and notes, with sketches, measurements and photographs are taken, and elaborated into comprehensive reports by each student after the return.

During April, 1910, the mining districts and the reduction plants of Globe, Miami, and Ray were visited in this way. The thanks of the University are due the managers and superintendents of the various mining companies for their efforts and care in acquainting the students with the work under their management.

**PHILOSOPHY AND EDUCATION.**

MRS. STANLEY.

**1, 2. History of Philosophy.** MRS. STANLEY.

A study of the basal concepts and fundamental problems of philosophical thought as developed historically. Lectures, recitations, and assigned reading. Texts: Weber, *History of Philosophy*; Calkins, *The Persistent Problems of Philosophy*.

3 hrs., both semesters. M W F, 9. 6 units.

**3. Psychology.** MRS. STANLEY.

A special consideration of the subject as applied to teaching. Lectures, recitations, and collateral reading. Open to sophomores, juniors, and seniors. Text: Angell, *Psychology*.

2 hrs., both semesters. 4 units.

**\*4. Pedagogy.** MRS. STANLEY.

An account of educational evolution, both as a culture fact in the history of civilization and as a foundation for professional work. Arrangements have been made with the Tucson City Schools to provide practice work for this class. Open to students who have taken Philosophy 3.

2 hrs., both semesters, M W, 10. 4 units.

**\*5. Logic.** MRS. STANLEY.

Text: Jevon, *Logic*; reading from Mill, Hamilton, Thompson, and others. Open to juniors and seniors.

4 hrs., first semester. 4 units.

**6. Ethics.** MRS. STANLEY

Theoretical and practical ethics; view of the historical development of the science; origin and development

of the moral consciousness; application of the principles of ethics to the problems of life. Lectures, discussions, and assigned reading. Open to juniors, and seniors. Text: Dewey and Tufts, *Ethics*.

3 hrs., second semester. 3 units.

**\*7. Philosophical Problems in Great Books.**

MRS. STANLEY.

A comparative study of interpretations of life as revealed in masterpieces of the world's literature.

This course is designed to meet the needs of students who can not afford the time for advanced English or philosophy, as well as to supplement the course now offered in those departments. The programme as planned will include ten great books, viz.: Sophocles, *The Antigone*; Socrates, *The Apology*; *The Book of Job*; Dante, *Divine Comedy*; Hugo, *Les Misérables*; Goethe, *Faust*; Tolstoi, *Anna Karenina*; Ibsen, *Peer Gynt*. Lectures and interpretative readings. Open to all juniors and seniors.

1 hr., both semesters, F, 8. 2 units.

**PHYSICAL TRAINING.**

MR. KLEEGERGER, MISS MERRIMAN.

The department of physical training has general direction of the gymnastic and athletic activities of the University. The department aims to give the students such exercises, games and sports as will best create and maintain a vigorous physical health, and to this end it strives to reach as many persons as possible, especially the weak and undeveloped, and to give to each one exercise that will at once benefit, interest, and stimulate.

Physical training is prescribed for all freshmen and sophomores from October 1st to May 15th. With the approval of the director of the gymnasium, students may substitute some form of regular athletic work for the course in the gymnasium for specified periods.

**A. Physical Examinations for Men.** MR. KLEEBCERGER.

The examination includes about thirty measurements of the body, tests of strength, and examination of the heart, lungs, and other vital organs, together with inspection for marks of vaccination and physical inequalities. Prescribed for all freshmen and sophomores at the beginning of the year or on entrance into these classes. A second examination is optional with the instructor, while a rigid and complete special examination by the University physician may be ordered at any time without expense to the student.

**1, 2. Gymnastics and Hygiene for Men.**

MR. KLEEBCERGER.

Setting up exercises, calisthenic drills, indoor games, and simple apparatus work. Lectures on the physiology of exercise, personal hygiene and corrective exercises. Required of all freshmen unless excused on recommendation of the University physician.

2 half-hour periods, both semesters. 1-2 unit.

**3, 4. Advanced Gymnastics.** MR. KLEEBCERGER.

A continuation of the work of the first year; the use of apparatus, parallel bars, horizontal bar, horses, rings, out-door runs, etc. When possible the class will be divided into graded sections for special work on the apparatus. Required of all sophomores unexcused by the University physician.

2 half-hour periods, both semesters. 1-2 unit.

**5, 6, 7, 8. Gymnastics for Women.**

MR. KLEEBCERGER AND MISS MERRIMAN.

The work is prescribed for young women as for men, and resembles that for men in its general scope and aim. It is, however, modified to suit the needs of the young women, emphasis being laid upon poise, carriage, grace, and development. Music is used for class drills, marching, and dancing. A gymnasium suit is necessary, consisting of a loose blouse waist, divided skirt, and the regular gymnasium shoes. The waist has a sailor collar trimmed with white braid. Four yards of double width, 54-inch dark blue serge is required, if Butterick patterns are used; ready-made suits may be purchased for about \$4 at the gymnasium. Required of freshmen and sophomores.

3 half-hour periods each semester. 2 units.

**B. Football, Baseball, Basketball, Tennis, and Field and Track Work.**

Recreative sports as a relaxation from study and as a means of development are recognized by the University in its provisions of fields, courts, etc., and by its acceptance of time devoted to such sports, with the approval of the director of the gymnasium, as satisfaction for part of the requirements in physical training. Save for the traditional seasons fixed for these sports by climatic conditions in other regions, they might all be indulged in throughout nearly the whole academic year, as is the case with tennis. The direct control and management of these sports and of the competitive games with outside teams, are vested in the Athletic Association of the University of Arizona, made up of both students and faculty, but officered by students. During the cur-

rent year, contests have been held with the University of New Mexico, and the Fort Huachuca team in football; with the Tempe Normal School in Tempe and in Tucson, in baseball and tennis; with the Phoenix high school, in Phoenix; and Tucson, in baseball; with the Bisbee high school in basketball; and with the Tucson high school in baseball and basketball.

## PHYSICS.

PROFESSOR DOUGLASS.

The object of this course is to acquaint the student with the fundamental physical principles which underlie the higher courses of chemistry, mechanics and engineering. Note books are required in all courses.

### 1, 2. General Physics. PROFESSOR DOUGLASS.

Lectures, recitations and laboratory work. First semester: mechanics and heat. Second semester: Electricity, wave motion, sound and light. The laboratory experiments give prominence to general electrical measurements, but include the study of wave motions and their application to the other subjects. Prerequisites: a course in elementary physics and mathematics 1.

2 hrs., and two 2-hr. periods in the laboratory, both semesters., M W F, 11-12, T TH, 10-12. 8 units.

### 3. Thermodynamics and Heat. PROFESSOR DOUGLASS.

A study of the foundation principles underlying mechanical engineering, latent and specific heats, conductivity, expansion, mechanical equivalent, high temperatures, cycles, entropy, properties of steam, etc. Prescribed for third year in mechanical engineering course.

1 hr. and two 2-hr. periods, first semester. 3 units

#### 4. Electrical and Optical Measurements.

PROFESSOR DOUGLASS.

A study of the electrical machines and instruments used in mechanical engineering, and of the optical instruments handled in mining and civil engineering courses. Prescribed for the third year in mechanical and civil engineering courses. Three 3-hr. periods, second semester. 4 units.

#### SPANISH.

PROFESSOR TURRELL, DOCTOR ALDRICH.

##### 1, 2. Elementary Spanish.

DR. ALDRICH.

First semester, Hills and Ford, *Spanish Grammar*, Turrell, *Spanish Reader*, begun. Conversation and oral work. Second semester: grammar and reader completed; additional readings with composition and diction.

5 hrs., both semesters. I, M T W TH F, 9; II, M T W TH F, 11:30. 8 units.

##### 3, 4. Advanced Spanish.

DR. ALDRICH.

First semester: Reading of Johnson, *Cuentos Modernos*, Alarcón, *El Capitan Veneno*. Second semester: Galdós, *Marianela*, Valdes, *La Alegria del Capitan Ribot*, etc. Three hours each week during the first semester and two hours during the second will be given to composition, letter writing and syntax, using Umphrey, *Spanish Composition* and Bonilla, *Spanish Daily Life*.

5 hrs., both semesters, M T W TH F, 1. 8 units.

##### 5. Spanish Literature to the Nineteenth Century.

PROFESSOR TURRELL.

Lectures in Spanish on the early literature of Spain, the "Siglo de Oro," etc., with library readings. Class

study of Cervantes, *Don Quijote* (Selections), Lope de Vega, *La Estrella de Sevilla*, Calderón, *La Vida es Sueno*, etc.

3 hrs., first semester; M W F, 9. 3 units.

#### 6. Spanish Literature in the Nineteenth Century.

PROFESSOR TURRELL.

Particular study of the drama. Reading of Moratin, *El Si de las Ninas*, Larra, *Partir a Tiempo*, Gutiérrez, *El Trovador*, Tomayo y Baus, *Lo Positivo*, Nunez de Arce, *El Haz de Lena*, Echegaray, *El Gran Galeoto*, Galdós, *Electra*.

3 hrs., second semester; M W F, 9. 3 units.

#### \*7. General Survey of the Literature of the Countries of Spanish America.

PROFESSOR TURRELL.

Class reading of Ugarte, *La Joven Literatura Hispano-americana*, Hills, *Bardos Cubanos*, Avellaneda, *Baltasar*, etc.

2 hrs., first semester, T TH, 9. 2 units.

#### \*8. History of Mexican Literature.

PROFESSOR TURRELL.

Reading of works by the best authors, as included in the *Biblioteca de Autores Mexicanos*, etc.

2 hrs., second semester, T TH, 9. 2 units.

#### 9, 10. Advanced Spanish Composition and Commercial Spanish.

PROFESSOR TURRELL.

A practical course in writing and speaking Spanish. Harrison, *Spanish Correspondence*, Remy, *Spanish Composition*, etc. will be used. Original essays, letters and reports in Spanish. (May be taken with courses 5, 6, but must be preceded by courses 1, 2, 3, 4.)

2 hrs., both semesters. 4 units.

**ZOOLOGY**

MR. BROWN

**1. Invertebrate Zoology.** MR. BROWN.

The development and anatomy of types of the various phyla of invertebrates. Text: Parker and Haswell, *A Manual of Zoology*.

2 hrs. of lectures and 6 hrs. of laboratory work, first semester, M W, 3, M W, 2-3, T TH, 2-4. 4 units.

**2. Vertebrate Zoology.** MR. BROWN.

A continuation of course 1.

4 units.

**LAW.**

MR. GALBRAITH

**1, 2. Elementary Law.** MR. GALBRAITH

The first semester will deal with the leading principles in each of the more prominent branches of the law, including Crimes, Contracts, Torts, Titles, Wills, Mortgages, Bills and Notes, etc.

The second semester will deal more intensively with federal and state regulation of commerce, and mining and irrigation law.

The course will be primarily a lecture course, but for those desiring full credit toward a degree, collateral reading and study of cases will be required.

3 hrs., both semesters; M W TH, 7 P. M. 4 units.

# **PUBLIC LECTURES AND ADDRESSES TO THE STUDENTS.**

1909-1910.

September 24.

William Jennings Bryan. "Faith."

October 22.

Robert H. Forbes, Director of the Agricultural Experiment Station. "Our Farmers and Our Future."

November 18.

Allen T. Bird, Editor of "The Oasis," Nogales.  
"The Invisible Empire of Transportation."

November 30.

George R. Parkin, Organization Secretary of the Rhodes Scholarship Trust. "Cecil Rhodes and the Rhodes Scholarships."

December 3.

Henry Suzallo, Professor of the Philosophy of Education in the Teachers' College, Columbia University. "The Meaning of University Training."

December 16.

Francis J. Heney, Special Assistant District Attorney, San Francisco. "Civic Duties."

December 17.

Louis C. Hill, Supervising Engineer of the United States Reclamation Service in Arizona and Southern California. "The Economic Importance of Government Reclamation Work, with especial Reference to Arizona."

January 15.

James H. McClintock, Press Correspondent and Postmaster, Phoenix. "The relation of the Press to the Development of Arizona."

February 1.

Anita Newcomb McGee., formerly Acting Assistant Surgeon, United States Army, and Supervisor of Nurses in the Japanese Army. "Experiences in the Japanese Army."

February 10.

Joseph E. Stubbs, President of the University of Nevada. "The Obligations of the College Man."

March 8.

Henry S. Pritchett, President of the Carnegie Foundation for the Advancement of Teaching. "Educational Democracy and Student Obligation."

April 12.

James C. Monaghan, National Lecturer of the Knights of Columbus. "Opportunity."

April 9, 12, 16.

Ellsworth Huntington, Assistant Professor of Geography in Yale University.

"The Yale Expedition to Palestine." (Illus.)

"Briton and Russian in Asia."

"Climate and History." (Illustrated).

April 20.

William L. Finley, Ornithologist and Author.

"Hunting Wild Birds with a Camera," (Illus.).

April 14.

H. V. Faylor, Secretary of the Tucson Chamber of Commerce. "The Purpose and Work of Commercial Organizations with Special Reference to the Tucson Chamber of Commerce and its Relations to the Development of Arizona."

## SHORT COURSE IN AGRICULTURE.

This course is offered, first, to meet the demands of prospective homeseekers who desire to learn something about the general principles and practices of irrigation farming before engaging in actual farm operations in Arizona. Second, to give the young man who feels that he can not afford the time or the means to pursue a full college course a brief introduction to some of the more important scientific principles and facts that are the basis of successful farming, before he settles down to his chosen business, as well as to give him a measure of that broad general culture that is always incidental to University life, and which makes so much for good citizenship. Third, to equip young men to take advantage of opportunities and to fill positions demanding more intelligence and skill than ordinary farm labor. Opportunities and positions for young men of such training are now open in Arizona and will become more frequent as the great reclamation projects being carried on are completed. As specific examples may be mentioned: First, the employment as present by the U. S. Reclamation Service and private ditch companies of many ditch superintendents, all of whom need special training for the work. These positions are constantly changing personnel and the number of such men so employed will more than double within the next two years. The positions pay from \$75 to \$135 per month. Second, there are vast areas of desert land in Arizona that may be reclaimed by pumping, and the

opportunities for development of this kind of irrigation farming have scarcely been touched; but to make the most of such opportunities one will need more mechanical skill and more knowledge of the physical properties of soil than the average farmer possesses. Third, the University has recently had several calls for farm managers at salaries ranging up to \$150 per month, and expects such calls to increase in number. Courses in Irrigation Engineering, Farm Management, Soil Physics, Vegetable Gardening, Orchard Management, and Farm Dairying, are especially designed to equip young men to take advantage of these opportunities and positions.

#### ADMISSION.

Students will be admitted to the short course who have a general knowledge of the common school branches and sufficient maturity in years to understand the value of their time and opportunity. They will be accorded the same privileges, and required to observe the same regulations, as other students registered in the University and resident upon the campus.

#### EQUIPMENT.

The University is amply equipped with library, laboratory, and green-house facilities, while the development of a farm of 80 acres recently purchased will give opportunity for an abundance of practice in the application of the knowledge gained in the class room, library, laboratory and green houses.

The following outline of the course of study indicates the scope of the work done. In addition to the time spent in the class room indicated below, students will be required to do a limited amount of work on the farm, for which they will be paid by the University.

## I YEAR.

## FIRST SEMESTER.

## SECOND SEMESTER.

|                           |   |                         |   |
|---------------------------|---|-------------------------|---|
| Breeds of Farm Animals... | 3 | Breeds of Farm Animals. | 3 |
| Plant Culture and         |   | Farm Management.....    | 3 |
| Orchard Management...     | 5 | Gardening.....          | 3 |
| Algebra.....              | 5 | Algebra.....            | 5 |
| English.....              | 5 | English.....            | 5 |
| Drawing and Shop.....     | 5 | Drawing and Shop.....   | 5 |

## II YEAR.

|                             |   |                           |   |
|-----------------------------|---|---------------------------|---|
| Feeds and Feeding.....      | 3 | Soils.....                | 5 |
| Dairying.....               | 5 | Veterinary Science.....   | 5 |
| Poultry.....                | 3 | Principles of Breeding... | 5 |
| Irrigation Engineering..... | 5 | Chemistry.....            | 5 |
| Chemistry.....              | 5 |                           |   |

## BUREAU OF MINES AND ASSAYING.

A separate department of the School of Mines under the name of "The Bureau of Mines and Assaying" has been established to receive and work ores, and to make assays and analyses of ores, minerals, mineral waters and petroleum.

In accordance with the Act of the Legislature of the Territory, approved March, 1897, and amended in March, 1899, assays of ores and minerals are made for the prospectors and miners of Arizona and for others at fixed rates established by the law, and tabulated below. To meet the requirements of this work a special laboratory building of brick has been erected and maintained. Qualitative determinations of the nature of samples are made free.

Extreme accuracy and excellence of work are considered of more importance than pecuniary profits. All assays are made in duplicate and if not accordant are repeated. The work of the Bureau is under the personal direction of the professor of metallurgy and a paid assistant; the assays are not made by students, who receive their instruction in the regular laboratories of the University.

The money received for assaying is deposited monthly to the credit of the assay fund which is used to pay the assayer and the cost of material and apparatus.

**RATES FOR ASSAYING AND CHEMICAL DETERMINATIONS.****COMMON ASSAYS AND CHEMICAL DETERMINATIONS.**

One element only:

|                                                                 |        |
|-----------------------------------------------------------------|--------|
| Gold, or silver, or copper, or lead, or iron, or insoluble..... | \$1.00 |
| Zinc, or calcium, or magnesium, or sulphur, or manganese.....   | 1.50   |
| Silicon or chlorine.....                                        | 2.00   |

Combinations:

|                                                |      |
|------------------------------------------------|------|
| Gold and silver.....                           | 1.00 |
| Copper and iron, or lead and iron.....         | 1.50 |
| Insoluble, copper, and lead... ..              | 2.00 |
| Insoluble, copper, and iron.....               | 2.00 |
| Insoluble, lead, and iron.....                 | 2.00 |
| Insoluble, zinc, and iron.....                 | 2.50 |
| Insoluble, lead, copper, and iron.....         | 2.50 |
| Gold, silver, copper, and lead.....            | 2.50 |
| Gold, silver, copper, iron, and insoluble..... | 2.50 |

**SPECIAL CHEMICAL DETERMINATIONS.**

One element only:

|                                                                                                                           |        |
|---------------------------------------------------------------------------------------------------------------------------|--------|
| Aluminum, or tungsten, or barium, or chromium                                                                             | 3.00   |
| Cadmium, or tin, or arsenic, or bismuth or antimony, or titanium, or sodium, or potassium, or uranium, or phosphorus..... | \$4.00 |
| Nickel, or cobalt, or molybdenum, or vanadium                                                                             | 5.00   |

**CHEMICAL ANALYSIS.**

|                                                                                              |       |
|----------------------------------------------------------------------------------------------|-------|
| Coal and coke analysis, giving moisture, volatile combustible matter, fixed carbon and ash.. | 5.00  |
| The same, including determination of sulphur and phosphorus.....                             | 7.50  |
| Silicate analysis.....                                                                       | 15.00 |
| Cement analysis (chemical).....                                                              | 15.00 |

|                                                                                             |       |
|---------------------------------------------------------------------------------------------|-------|
| Cement analysis (mechanical) . . . . .                                                      | 2.50  |
| Cement tests for strength and soundness by<br>the Department of Civil Engineering . . . . . | 3.00  |
| Boiler water analysis . . . . .                                                             | 10.00 |

### RATES FOR TESTING ORES.

Stamp mill amalgamation, including sampling, assays, retorting, etc.:

For lots of one ton or thereabouts . . . . . \$30.00

The same, with concentration of pulp on Wilfley  
table. . . . . 30.00

For lots of two tons, without concentration . . . . . 40.00

For lots of two tons, with concentration . . . . . 45.00

Smaller amalgamation tests, including all sampling charges, and concentration after amalgamation:

For small samples, up to five pounds . . . . . 7.00

For small samples, five to twenty-five pounds . . . . 10.00

For small samples, twenty to one hundred pounds 15.00

In these smaller tests, the sample is ground to pass a suitable mesh, and is agitated with mercury. The mercury is panned out, retorted, and the values determined in bullion. The values in the concentrates and tailings are also determined. The number of tests necessary to determine the adaptability of any ore to treatment in cyaniding varies so greatly that no general rates can be offered.

### CONSIGNMENTS, REMITTANCES, ETC.

Samples, ores, and other consignments should be shipped to the University of Arizona, the School of Mines, Tucson, Arizona. Small quantities may best be sent by mail, at the rate of one cent per ounce; larger quantities by express or by freight. The Wells Fargo Ex-

press Company makes daily deliveries at the University.

All assays, chemical determinations and chemical analyses, except gratuitous qualitative tests mentioned elsewhere, must be paid for in advance.

No determination of any kind will be made until the required payment arrives. Remittances should be made by postoffice money order, Wells Fargo money order, bank draft, or check on a Tucson bank, payable to K. C. Babcock, President, University of Arizona, to whom also business communications relating to matters discussed in this circular should be addressed.

## AGRICULTURAL EXPERIMENT STATION STAFF.

KENDRIC C. BABCOCK, Ph. D., President of the University.

ROBERT H. FORBES, M. S., Director and Chemist.

JOHN J. THORNER, A. M., Botanist.

ALBERT E. VINSON, Ph. D., Biochemist.

FREDERICK W. WILSON, B. S., Animal Husbandman.

G. E. P. SMITH, C. E., Irrigation Engineer.

ROBERT W. CLOTHIER, M. S., Agriculturist.

GEORGE F. FREEMAN, B. S., Plant Breeder.

WILLIAM B. MCCALLUM, Ph. D., Associate Botanist.

WILLIAM H. ROSS, Ph. D., Assistant Chemist.

FRANK C. KELTON, B. S., Assistant Engineer.

A. W. MORRILL, Ph. D., Entomologist.

E. DANA TROUT, Secretary.

### ORGANIZATION AND WORK.

The Agricultural Experiment Station is a legally constituted department of the University, whose purpose is to aid "in acquiring and diffusing \* \* \* useful and practical information on subjects connected with agriculture, and to promote scientific investigation and experiment respecting the principles and applications of agricultural science."

With the above objects in view the organization of the station, includes the departments of administration, agriculture, horticulture, animal husbandry, botany, plant physiology and pathology, chemistry, and irrigation investigations, the whole or a major portion of the time of one or more members of the station staff being devoted to each department of the station work. Provision is made for meteorological work also, though to a less degree.

Owing to the wide variation in agricultural conditions in Arizona, it has been found of advantage to distribute the work so that each department is located, so far as possible, in that region most favorable to the accomplishment of its own special results. According to this principle, the various lines of Experiment Station work have been distributed as follows:

The Director's office and the departments of botany, plant physiology and pathology, chemistry, and irrigation investigations are maintained at Tucson in the University buildings. Through this arrangement the Experiment Station profits by the buildings and libraries of the University, while the University is benefitted from time to time by the teaching ability of members of the Station staff. It has been found that from this base of operations the three great agricultural districts of the Territory—Salt River Valley, the lower Colorado, and the upper Gila—are accessible with equal convenience for field work and observations.

On the same ground—fitness of location for the work undertaken—the Experiment Station Farm has been maintained and strengthened at Phoenix. Salt River valley is intermediate in elevation, in situation, and in mean yearly temperature, between the other two important farming districts above mentioned, and for this reason the agricultural and horticultural results obtained there are capable of the most general application in the Territory at large.

On the same principle again, the date palm orchard, conducted in co-operation with the United States Department of Agriculture, is located in the alkaline district south of Tempe, where a successful demonstration

of this palm as a commercial fruit producer will be of the greatest value, creating use for great areas of alkali land in the arid southwest.

The demonstration farm near Yuma, in the fertile Colorado valley bottom, has likewise afforded a succession of object lessons to the public of that locality, as well as much needed information concerning crops, agricultural methods and markets for that rich region.

Experiments in dry-farming have been undertaken on tracts in the Sulphur Springs Valley, between Willcox and Douglas, and in the neighborhood of Snowflake in Navajo County, in localities typical of large areas.

The range station, also, for the study of worn-out range country with a view to its reclamation to usefulness, is conducted in a typical district near Tucson, and is conducted under the auspices of the department of botany, co-operating with the United States Department of Agriculture.

The results of the Experiment Station work are made public at frequent intervals in the bulletins and reports of the Station. These publications are made in two series: First, the longer and more technical bulletins, stating in considerable detail the investigations as they mature; and, secondly, the Timely Hints for Farmers, which are brief writings issued at the time when they will be most useful, written in plain language, and presented in popular form.

Along its several general lines of effort the Station during the ten years ending with 1909 has issued 108 publications, exclusive of annual reports which contain

much technical information of similar character. These publications may be classified as follows:

|                                             |    |
|---------------------------------------------|----|
| Soils, waters, alkali, and farm management  | 25 |
| Climate.....                                | 1  |
| Crops.....                                  | 40 |
| Weeds, insect pests and plant diseases..... | 15 |
| Irrigation.....                             | 10 |
| Animal industry and the range.....          | 17 |

When it is remembered that for years past the mailing list has enabled us to reach from forty to fifty per cent of the farming population of the Territory, it is not surprising that the effects of Station work are now generally in evidence, more particularly in our irrigated southern valleys.

Continuing with former appropriations the Twenty-Fifth Territorial Legislature set aside \$13,100 for the use of the Experiment Station for the bienium ending in 1911. This appropriation provides for printing, for Farmers' Institutes, for dry farming experiments, for the maintenance of the date orchard at Tempe and the demonstration farm at Yuma. Supplementing the Federal funds, therefore, provision is made for the symmetrical development of this work in the Territory, both experimentally and educationally; and, prospectively, "the farmers' college" bids fair to increase in usefulness to the growing agricultural interests of the Territory.

## PREPARATORY DEPARTMENT. FACULTY.

KENDRIC CHARLES BABCOCK, Ph. D., President.

HENRY A. E. CHANDLER, B. S., Principal.

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CHARLES A. TURRELL, A. M., French, German, Spanish.

WILLIAM W. HENLEY, A. B., Shopwork and Drawing.

ANDREW ELLICOTT DOUGLASS, D. Sc., Physics.

ROBERT W. CLOTHIER, M. S., Agriculture.

CAPT. HIRAM M. POWELL, Military Science and Tactics.

WILLIAM GEORGE MEDCRAFT, A. M., Mathematics.

RAYMOND C. BENNER, Ph. D., Chemistry.

LEVONA PAYNE NEWSOM, Ph. D., Latin and Greek.

FRANK LEWIS KLEEGER, B. S., Physical Training  
and Mathematics.

FREDERICK E. TALMAGE, B. L., Bookkeeping, Steno-  
graphy, Typewriting.

IDA C. REID, Ph. B., Mathematics and History.

HELEN JANE ALDRICH, Ph. D., Spanish and French.

CAROLINE BATES SINGLETON, A. B., English and Latin

ETHELBERT W. WALDRON, A. B., English.

ELIZABETH ELLINWOOD ROBERTS, A. B., German.

WILLIAM L. FOWLER, B. S., Animal Husbandry.

FRANCES CROWELL, Music.

### GENERAL INFORMATION.

In this department the University offers the work of a well organized, four-years high school, with the added advantages of shop work and drawing, and mili-

tary drill. The general library and gymnasium are open to all students in this department.

The equipment of the scientific laboratories is available for use in this preparatory work, whenever it can be used advantageously, and makes possible strong work in elementary science. The instructors in this department are assisted by the professors of the college departments, several of whom regularly conduct preparatory classes. By reference to the course of study which follows, it will be seen that it offers a comprehensive training for those who may not be able to pursue their studies farther, while it gives a good preparation for college.

Admission to regular standing in the first year of the preparatory course presupposes the completion of the work of the eighth grade of the public or parochial schools. Students who do not bring certificates showing the completion of this work, must take examinations to test their ability to pursue profitably the work of the first year. Pupils who have not completed the work of the ninth grade (or the first year of a high school) will not be admitted into the University from cities in Arizona having more than 5,000 population.

All students entering the preparatory department will be required to take an examination in oral reading. To remedy notable deficiency in this subject, the University will require extra work in addition to other studies. In all cases in which the preparation of a student in a particular subject proves to be deficient, the University reserves the right to require the student to secure at his own expense the help of an approved coach until the deficiency is remedied.

## LIVING ACCOMMODATIONS AND EXPENSES.

A portion of South Hall is set apart for the use of male preparatory students; details of furnishings, living expenses, etc., are set forth in a paragraph earlier in this Register. These expenses are substantially the same for both college and preparatory students, save that laboratory fees and book bills are higher for the former. The expenses necessarily incurred during the academic year are about \$300, but of this amount nearly one-third falls due in the first month, or in the six weeks before November 1st, in the form of charges which are made but once during the year. The following are the estimated ordinary expenses for the first month:

|                                                                                              |        |
|----------------------------------------------------------------------------------------------|--------|
| Incidental fee.....                                                                          | \$5.00 |
| Mattress, blankets, pillows, sheets, etc., (unless<br>brought from home by the student)..... | 15.00  |
| Board for the first month, including napkin fee..                                            | 18.50  |
| Books.....                                                                                   | 6.00   |
| Shop and Drawing fee.....                                                                    | 5.00   |
| Military uniform.....                                                                        | 16.25  |
| Student Associations (voluntary).....                                                        | 5.00   |

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\$73.75

The dormitory is placed in charge of two resident instructors, assisted by a committee of students. Inspection of rooms is made in the morning and in the evening by the head of the dormitory. The hours from seven to quarter past nine in the evening are observed as study hours except on Fridays and Saturdays. Students under twenty-one years of age are required, unless relieved by the President, to obtain permission to leave the campus, or to leave the dormitory during study hours, except on Sundays from nine to twelve

A. M., Wednesdays, four to seven P. M., and Fridays, four to six P. M. Breaches of the regulations of the dormitory are punished by "extra study"—labor about the buildings or grounds—by confinement to rooms, or by expulsion from the dormitory; for damage to University property, a money penalty is imposed.

#### COURSE OF STUDY.

The following course of study will be required of all students who fit themselves at the University for entrance to the freshman class in 1911. Such variations from it will be permitted as will adapt it to the case of students who took part of their work in other schools.

Military drill is required of all able-bodied male students throughout the course. Physical training is required of all students, unless they are excused by the President upon presenting a certificate from one of the University physicians. The young men have drill three times per week and exercise in the gymnasium twice. The young women have physical culture three times a week.

The language begun in the first, second or third year must be pursued for at least two years in order to secure credit towards graduation.

Though the subjects are for convenience grouped by years in the following schedule, the departmental method is followed. In the description of courses, the subjects are arranged by groups or departments in the consecutive order in which they are taken up and students will be required to take them in this order. Aside from this sequence the ability of each student must determine what subjects will be pursued at any given time, due regard being given to the proper balance of

subjects. The wishes of parents will always be given careful consideration in making up the schedule of work for each student, but the final decision in the matter rests with the committee on registration, which is composed of persons who have had long experience in secondary and collegiate teaching. Individual attention will be given to the needs of each student.

To each student who completes the studies of this course, receiving a total of fifteen and one-half units (a unit representing a subject pursued for one year with five, or four, recitation periods per week), a certificate stating that fact will be given, entitling the holder to admission to the corresponding University courses of instruction without examination.

Subjects thus marked (\*) are elective. Five hours of elective must be chosen in the second year. In the third and in the fourth year, electives making up at least nine hours must be chosen. The figures indicate hours or exercises per week.

## FIRST YEAR.

|                          |   |                           |   |
|--------------------------|---|---------------------------|---|
| English.....             | 5 | Drawing and Shop work,    |   |
| Algebra.....             | 5 | or agriculture, or a for- |   |
| Greek and Roman History. | 3 | foreign language.....     | 5 |
| Physical Geography.....  | 3 |                           |   |

## SECOND YEAR.

|                       |   |                          |   |
|-----------------------|---|--------------------------|---|
| English.....          | 5 | *Drawing and shopwork    | 5 |
| Algebra.....          | 5 | *A foreign language, 1st |   |
| European History..... | 5 | or 2nd year.....         | 5 |
| *Agriculture.....     | 5 |                          |   |
| *Bookkeeping.....     | 5 |                          |   |

## THIRD YEAR.

|                     |   |                          |   |
|---------------------|---|--------------------------|---|
| English.....        | 5 | *Foreign languages, 1st, |   |
| Plane Geometry..... | 5 | 2nd, or 3rd year Latin,  |   |
| *Chemistry.....     | 5 | each.....                | 5 |

## FOURTH YEAR.

|                             |   |                          |   |
|-----------------------------|---|--------------------------|---|
| English.....                | 5 | *Latin(2nd or 3rd yr) .. | 4 |
| American History and Civics | 5 | *Greek(2nd year) .....   | 5 |
| *Solid Geometry(1st half)   | 4 | *French(2nd year) .....  | 5 |
| *Trigonometry(2nd half)     | 5 | *German(2nd year) ...    | 5 |
| *Physics.....               | 5 | *Spanish(2nd year)....   | 5 |

## ENGLISH.

The English of the preparatory course is based upon what is known as the entrance requirements of New England colleges. The work is in general divided into three parts: classics, studied in class; composition and grammar work done partly in class and partly outside; and supplementary reading done largely outside the class room. All these parts of the work may be carried on at the same time, as the circumstances of the class seem to require, the classics and supplementary reading forming the basis of a large part of the work in grammar and composition. Throughout the course, however, a primary aim is to develop the student's individual power of expressing himself in words. The time allotted to these three phases of English varies from year to year, increasing attention being paid to the appreciative and critical faculty as the course advances. In the fourth year a brief outline history of English literature occupies about one-half of the year's work in English.

Five hours each week throughout the course are given to English. According to the following general

outline, selections from the list below are made at the discretion of the teacher, preference being given to the New England College Entrance Requirements, which are marked by an asterisk \*.

## FIRST YEAR.

ENGLISH GRAMMAR AND COMPOSITION receive one-half of the time of the first year. Maxwell, *Advanced Lessons in English Grammar* is used as a text-book.

CLASSICS. Shakespeare, \**Merchant of Venice*, Scott, *Marmion*, Irving, \**Sketchbook*, Longfellow, *Hiawatha*, Franklin, *Autobiography*, Burroughs, *Sharp Eyes*.

SUPPLEMENTARY READING. Longfellow, *Evangeline*, Scott, \**Ivanhoe* and *The Talisman*, Cooper, *Last of the Mohicans*, Hale, *Man Without a Country*, Mark Twain, *Tom Sawyer*, Jack London, *Call of the Wild*, Wells, *War of the Worlds*.

## SECOND YEAR.

COMPOSITION AND GRAMMAR. As in the first year, with attention to figures of speech, reproducing the work of classic authors, elementary etymology, exercises in composition, narration, and description.

CLASSICS. Coleridge, \**Ancient Mariner*; Poe, \**Poems* and *Tales*; Hawthorne, \**House of the Seven Gables*; Tennyson, \**Idylls of the King*; Lowell, \**Vision of Sir Launfal*; George Eliot, \**Silas Marner*.

SUPPLEMENTARY READING. Scott, *Lady of the Lake*; Blackmore, *Lorna Doone*; Irving, \**Alhambra*; Kingsley, *Westward Ho*; Dickens, *Oliver Twist*; Bret Harte, *Luck of Roaring Camp*; Stevenson, *Treasure Island*.

## THIRD YEAR.

COMPOSITION AND RHETORIC. Continued, with emphasis on elementary exposition and argumentation. Herrick and Damon, *Composition and Rhetoric* is used as a text-book.

CLASSICS. Shakespeare, \**Julius Caesar* and *Midsummer Night's Dream*; Addison, \**Sir Roger de Coverley Papers*; Macaulay, *Essays on Addison* and \**Johnson*; Goldsmith, *Vicar of Wakefield*; Carlyle, *Essay on Burns*; the Poems of Burns; Burke, \**Speech on Conciliation*.

SUPPLEMENTARY READING. Moore, *Lalla Rookh*; Irving, *Life of Goldsmith*; Austen, *Pride and Prejudice*; Dickens, *Tale of Two Cities*; George Eliot, *Mill on the Floss*; Barrie, *Sentimental Tommy*.

## FOURTH YEAR.

COMPOSITION AND GRAMMAR. Exercises in narration and description for flexibility and ease of expression and general preparation for college entrance requirements.

HISTORY OF ENGLISH LITERATURE. Study of Moody and Lovett, *First View of English Literature*, as a text-book, and reading of the following masterpieces: Chaucer, \**Prologue to the Canterbury Tales*; Shakespeare, \**Macbeth* and \**Henry V*; the shorter poems of \**Milton*, Wordsworth, \**Byron*, Shelley, Keats, Tennyson, and \**Browning*; Scott, *Pirate*; Dickens, *David Copperfield*; George Eliot, *Adam Bede*.

## MATHEMATICS.

ALGEBRA. First year: introduction, factoring, fractions, simple equations, simultaneous equations, and special problems. Second year: involution, evolution, theory of exponents, radicals, quadratic equations,

and proportion. The ground covered by these two years will be required for entrance to the engineering courses in college.

PLANE GEOMETRY. Third year: emphasis is laid on thorough work in original exercises.

SOLID GEOMETRY. First semester, fourth year, with original exercises.

PLANE TRIGONOMETRY. Second semester, fourth year.

### MECHANIC ARTS.

This work consists of both drawing and shop work, between which subjects the student's time is about equally divided. The course covers two years and is designed to furnish a thorough elementary knowledge of manual training as taught in the secondary schools of the country.

DRAWING. First year: Freehand sketching in perspective and orthographic projection. Reinhart's lettering, freehand working drawings. Second year: Mechanical drawing and geometrical problems.

SHOP WORK. First year: "Sloyd," care and use of woodworking tools. Second year: Forging, joinery, wood turning.

### SCIENCE.

It is the object of the courses in science to initiate the student into the processes and methods used in laboratory work; to teach close observation, careful manipulation and logical deduction; to acquaint the student with the fundamental facts of the various branches of science and to give full practice in the use of good English in describing various observations and experiments.

To insure better results in the notebooks, they will all be passed upon by one of the instructors in English.

#### PHYSICAL GEOGRAPHY.

This course, combining the laboratory method with the text-book, aims to give the pupils training in exact observation of familiar phenomena, like distance, weight, pressure of liquids and gases, temperature, winds, clouds, and the habits of plants and animals. The natural forces producing erosion, formation of soil, and rocks, the processes of nature as seen in seed germination and plant growth (with demonstrations with the microscope) will be discussed, with frequent experiments and field excursions. The entire country within the reach of the University is a great natural laboratory, full of interest and information for all. The course explains these features which become so familiar to everyone residing here.

#### CHEMISTRY.

A year's work with the text and in the laboratory, in such proportions as the instructor decides upon. Each student must keep a notebook in which he describes the process and results of his laboratory work.

#### PHYSICS.

The course aims to show that physics is not something abstract or mysterious, but is the simple explanation of everyday occurrences not usually understood and often unnoticed. It consists of three recitation periods and four laboratory periods per week, carried on along the lines laid down for the senior year in secondary schools. Each student must keep a notebook in which a minimum number of experiments must be written up.

### HISTORY.

The aim of the work in history is to lead the pupil to see the development of races and nations along political, social and religious lines, and to arouse in him a love for the subject and a habit of broad and discriminating reading.

The work of the first year consists of a survey of the development of the characteristics of the Greek and Roman civilizations. A text such as Wolfson, *Essentials of Ancient History*, or West, *Ancient History* will be supplemented by collateral reading and a notebook.

The work of the second year includes mediaeval and modern history. The aim is to give the student an idea of the essential unity of history and the leading facts in the political development of races and nations. Harding, *Essentials of Mediaeval and Modern History*, is used, supplemented by the reading of references.

Hart, *Actual Government*, is the textbook in civics. The historical development of the subject is made prominent, while practical problems, such as taxation and municipal government, are made the subjects of special investigation and study. The text in history will be Channing, *Students' History of the United States*.

### LATIN, GREEK, FRENCH, GERMAN, AND SPANISH.

Any one of these languages may be begun in the first or second or third year, and must be pursued for at least two years. Two languages may not be begun in the same year.

For an outline of the courses in Latin and Greek see pages 46, under requirements for admission.

For an outline of the courses in French, Spanish and German, see pages 76, 100, 80.

**BOOKKEEPING AND COMMERCIAL PRACTICE.**

Bookkeeping is taught by the modern budget system. The work is individual and each student may progress as fast as his time and ability permit. The course is thorough in all the details of office practice. Students are made familiar with different filing cabinets, the filing of letters, the use of card ledgers, the copying and indexing of letters and bills in copy books. The course includes instruction in commercial law, with special emphasis laid on the ordinary forms of commercial paper and the different endorsements. The department is equipped with the latest vertical files, cabinets, letter press and office sundries. All students in bookkeeping are required to take some other branch of mathematics and must show proficiency in English.

**STENOGRAPHY AND TYPEWRITING.**

A complete course in stenography is offered. The Gallagher-Marsh system, a system which has received the highest endorsement of leading court reporters on the Pacific Coast, and which has been adopted by the Boards of Education in the largest cities of California, has been used for six years. The object of the course is to train students so that they may become practical stenographers and a large amount of practicing outside the class is required. With this end in view particular stress is laid upon neatness, filing, copying and indexing. This branch of the commercial department is equipped with up-to-date filing cases, office sundries, and six typewriters, four of which are Remington, one an Oliver, and one the L. C. Smith Visible. Five of the typewriters are new. *Students taking this work are required to have had one year of High School English, and to take English with this course.*

## ALUMNI REGISTER.

The Alumni Association of the University of Arizona, organized on the second day of June, 1897, represents the body of graduates of the University; its object, as expressed in its constitution, is "To promote the interests of the University, to secure unity among its graduates and to foster an attachment to our Alma Mater."

1895.

\*Charles Oma Rouse, B. S.

Mercedes Anna Shibell, B. S., (Mrs. A. J. Gould),  
Tucson.

Mary Flint Walker, B. S., (Mrs. Pearl Adams),  
Benson.

1897.

Edward Marshall Boggs, C. E. (nunc pro tunc),  
Chief Engineer Oakland Electric Railways, Oakland,  
California.

Clara Cramond Fish, B. S., (Mrs. F. C. Roberts),  
Tucson.

George Ojeda Hilzinger, B. S., Attorney, Tucson.

Mark Walker, B. S., Metallurgist, Los Angeles,  
California.

1898.

Hattie Ferrin, B. S., (Mrs. Charles Solomon),  
Safford.

Granville Malcolm Gillett, B. S., Draughtsman in  
Surveyor General's Office, Phoenix.

---

\*Died 1906.

Minnie Watts, B. S., (Mrs. W. B. Smith), Altaville, California.

\*John Desha Young, B. S.

1899.

Robert L. Morton, B. S., Assayer, Yuma.

1900.

Ida Clarissa Flood, B. S., (Mrs. G. Dodge), Oakland, California.

Samuel Pressly McCrea, B. S., A. B., Principal of High School, Redwood City, California.

Charles Pierce Richmond, B. S., Mining Engineer, Phoenix.

Florence Russell Welles, B. S., (Mrs. Wm. Angus), Los Angeles, California.

1901.

Rudolph Castaneda, B. S., Engineer, Nacozari, Sonora, Mexico.

Clara Ferrin, B. S., Teacher, Tucson.

George Millard Parker, B. S., Denver, Colorado.

David Hull Holmes, B. S. (nunc pro tunc), Architect, Tucson.

1902.

Andrew Gilbert Aiken, A. B., B. S., Surveyor, Canton, New York.

Moses Blumenkranz, B. S., Assistant Superintendent Shannon Copper Company, Metcalf.

\*\*Ruth Brown, Ph. B., (Mrs. Wilkins Manning), Tucson.

Felix Grundy Haynes, B. S., Casa Grande.

---

\*Died 1899.

\*\*Died 1910.

Rose Belle Parrott, Ph. B., Teacher, Roseburg, Oregon.

Phillip Matthem Reilly, B. S.

Bertram L. Smith, B. S., Engineer, Silver Bell.

Bessie Smith, Ph. B., (Mrs. Earle Davis), Douglas.

Walter James Wakefield, Cashier, B. S., Tucson.

1903.

Advanced Degrees:

LL. D., Hon. William Herring, Tucson.

M. A., John William Gorby, (B. A., Marietta), Chicago, Illinois.

M. A., Benjamin Franklin Stacey, (B. A., B. D., Lombard), Teacher, Pasadena, California.

---

Richard Lamar Drane, B. S., Assistant Chief Engineer Randolph Lines, Tucson.

George Mark Evans, (LL. B., Michigan), Ph. B., Teacher, Los Angeles, California.

Leslie Alexander Gillett, B. S. (Mining), Draughtsman, Surveyor General's Office, Phoenix.

Georgia Ann Holmesley, Ph. B., Teacher, Clifton.

Edward Horton Jones, B. S., Assayer, Denver, Colorado.

John Williard Prout, Jr., B. S., General Manager Santa Cruz M. and S. Co., Mowry.

Thomas Edward Steele, B. S., Assayer, Sasco.

1904..

William Burnham Alexander, B. S., Civil Engineer, Tucson.

Elbert John Hollingshead (Kimble), B. S., Clerk, Seattle, Washington.

Estella Markham Prout, Ph. B. Teacher, Mowry.

John Willard Prout, Jr., B. S. (Mining), see 1903.

1905.

\*Ora Elinor Norway, Ph. B.

1906.

Advanced Degree:

M. S., William B. Begg, (A. B., Toronto).

---

Chester Bennett Clegg, B. S. (Civil Engineering).

John Wesley Gebb, B. S., Jerome.

Roy Bartley Kilgore, B. S. (Mining), Seattle, Washington.

Roy Gibbons Mead, B. S. (Mining), California.

Roy Webb Moore, B. S. (Mining), Mining Engineer, Tucson.

Carobel Murphey, (A. B., Cox College), Ph. B., Teacher, Tucson.

Ida Christina Reid, Ph. B., Instructor, University of Arizona, Tucson.

Minnie Louise Wooddell, Ph. B., Teacher, Tucson.

1907.

Advanced Degree:

Engineer of Mines, John Willard Prout, B. S., (Mining). See 1903.

---

Charles Alexander, Ph. B., Teacher, Tempe.

Harriet Estella Brown, Ph. B., Teacher, Tucson.

Lawrence Brodhead Croasdale, B. S. (Mechanical Engineering), Draughtsman, Delaware Water Gap, Pa.

Weda Ina Purcell, Ph. B., (Mrs. Ivy Marshall,) San Francisco, California.

Hugh Maupin Wolflin, B. S., U. S. Testing Engineer,  
Seattle, Washington.

1908.

Honorary Degree:

LL. D., William Phipps Blake, Sc. D., Tucson.

---

Carroll Pitkin Bradstreet, B. S., Pachuca, Mexico.

Benjamin Scott Dinsmore, B. S., Kingman.

William Arthur Tarr, B. S. (Mech. Eng.), Oklahoma,  
(Agricultural); B. S. (Mining), University of Chicago,  
Chicago, Illinois.

Hugh Maupin Wolflin, B. S. (Mining). See 1907.

Leigh Ernest Worthing, B. S., Bay City, Michigan.

1909.

Burrell R. Hatcher, B. S. (Mining), Mining Engineer,  
Tucson.

Ethel A. Hooper, Ph. B., Tucson.

Grace Ysabel LaBaree, Ph. B., Teacher, Tucson.

Anita Calneh Post, Ph. B., Teacher, Yuma.

John Mosheim Ruthrauff, B. S. (Metallurgy), As-  
sayer, Silver Bell.

Arthur Perry Thompson, B. S. (Mining), Garfield,  
Utah.

Mabel Wilkerson, Ph. B., Recorder's Office, Tucson.

## MILITARY ORGANIZATION.

MAY 29, 1910.

Commandant of Cadets:

CAPTAIN HIRAM McL. POWELL, U. S. A.

Assistant to Commandant:

MAJOR WARREN A. GROSSETTA, N. G. A.

### STAFF.

Adjutant . . . . . Acting Second Lieutenant L. D. La Tourrette.

Sergeant Major . . . . . Howard W. Estill

### COMPANY A.

Captain . . . . . Clifton H. Rolfe

First Lieutenant . . . . . Arthur O. Lovejoy

First Sergeant . . . . . J. Urbano Salazar

Sergeant . . . . . Ernest L. Barnes

Sergeant . . . . . Frank L. Culin

Corporal . . . . . Homer B. Gaddis

Corporal . . . . . W. Harold Munds

Corporal . . . . . Allen Tracy Bird, Jr.

### COMPANY B.

Captain . . . . . Sidney R. Jones

Second Lieutenant . . . . . Wm. R. Campbell

First Sergeant . . . . . Frank M. Cannon

Sergeant . . . . . James L. Bone

Sergeant . . . . . L. Guy Wilkey

Corporal . . . . . J. Stuart Bogan

Corporal . . . . . Richard L. Merritt

Corporal . . . . . Ben H. Clark

### TRUMPETERS.

Sergeant . . . . . Carlos Castaneda

Corporal . . . . . Marcus A. S. Ming

Private . . . . . Lawrence S. Hedges

Private . . . . . Chas. F. Simonds

Private . . . . . Daniel Olney

## COLOR GUARD.

|               |                     |
|---------------|---------------------|
| Sergeant..... | Ralph Rigg          |
| Sergeant..... | Earle P. Durley     |
| Private.....  | Fred W. Rogers      |
| Private.....  | ..Emil K. Wuerdeman |

# REGISTER OF STUDENTS.

## GRADUATES—13.

|                                                                          |           |
|--------------------------------------------------------------------------|-----------|
| Bates, Florence Fisher, A. B., Michigan; A. M., Columbia<br>English..... | Tucson    |
| Chapin, Theodore, B. S., Occidental.....                                 | Tucson    |
| Geology, Mineralogy.                                                     |           |
| Ham, Roscoe, B. S., Missouri (School of Mines).....                      | Tucson    |
| Geology, Mining Engineering.                                             |           |
| Hooper, Ethel Amis, Ph. B., Arizona .....                                | Tucson    |
| Mineralogy.                                                              |           |
| Layne, Newton Meade, A. B., Southern California ..                       | San Diego |
| English, Modern Languages, History.                                      |           |
| Murphey, Carobel, A. B. Cox College, Ph. B., Arizona ....                | Tucson    |
| English.                                                                 |           |
| Parsons, Belle.....                                                      | Tucson    |
| English.                                                                 |           |
| Roberts, Elizabeth Ellinwood, A. B., Western Reserve..                   | Tucson    |
| Spanish, French.                                                         |           |
| Schurtz, Vera Zoe, A. B., Michigan.....                                  | Tucson    |
| Spanish.                                                                 |           |
| Singleton, Caroline Bates, A. B., Wellesley.....                         | Tucson    |
| English, German.                                                         |           |
| Turrell, Norine Gayden, B. L., Shorter.....                              | Tucson    |
| Spanish.                                                                 |           |
| Wilkerson, Mabel, Ph. B., Arizona.....                                   | Tucson    |
| Business Practice.                                                       |           |
| Waldron, Ethelbert Webb, A. B., Michigan.....                            | Tucson    |
| English.                                                                 |           |

## SENIORS—11.

|                                                          |               |
|----------------------------------------------------------|---------------|
| Blades, Ernest Orrin.....                                | Tucson        |
| Callaway, Lawrence Arthur.....                           | Tucson        |
| Carpenter, Miles Miller, B. S., Texas (Agricultural).... | Tucson        |
| Disney, Lester .....                                     | Sedan, Kansas |
| Doan, Fletcher Morris, Jr.....                           | Douglas       |
| Douglass, Ida Whittington.....                           | Tucson        |
| Grossetta, Warren Arthur.....                            | Tucson        |
| Hoyt, Joseph Clyde.....                                  | Jerome        |

|                               |                        |
|-------------------------------|------------------------|
| Millar, Leslie Creighton..... | Tucson                 |
| Nash, Willard Henry.....      | Rapid City, S. D.      |
| Turner, R. Izer.....          | Huntington Beach, Cal. |

## JUNIORS—12.

|                              |                 |
|------------------------------|-----------------|
| Harrison, Ralph Waldo.....   | Ashland, Wis.   |
| Hartman, Miner Louis.....    | Phoenix         |
| Lugibihl, Myron Robert.....  | Bluffton, Ohio  |
| Lusk, Harry Wilton.....      | Tucson          |
| McDole, Maynard Matthew..... | Tucson          |
| Purcell, Ivy Mae.....        | Tucson          |
| Rebstock, Duane.....         | Tucson          |
| Rider, Jane Herbst.....      | Tucson          |
| Rose, Francis Winfred.....   | Solomonville    |
| Steele, Willard Penn.....    | Mansfield, Ohio |
| Strong, Leon Henri.....      | Tucson          |
| Welliver, George Warman..... | Oxford, Ohio    |

## SOPHOMORES—22.

|                                  |                   |
|----------------------------------|-------------------|
| Barnes, Ernest Lee.....          | Humboldt          |
| Bogan, Phœbe M.....              | Tucson            |
| Bone, James Lee.....             | Phoenix           |
| Bryan, William Jennings, Jr..... | Tucson            |
| Chisholm, Raymond.....           | Tucson            |
| Coles, Henry Oliver.....         | Bisbee            |
| Durley, Earle Preston.....       | Bisbee            |
| Groweg, Edward A.....            | Defiance, Ohio    |
| Higgins, John Joseph.....        | Los Angeles, Cal. |
| Johnston, Clifford French.....   | Tempe             |
| Kitt, Katherine Foote.....       | Tucson            |
| McDermott, Ora Martina.....      | Tucson            |
| McNeil, Clara May.....           | Tucson            |
| Mitten, James Ralph.....         | Worthington, Ind. |
| Nishihara, George Shikataro..... | Tucson            |
| Rice, Thomas Briggs.....         | Douglas           |
| Rick, Leo Zeno.....              | Tucson            |
| Sine, Eva Jessie.....            | Tucson            |
| Sine, Janet Volume.....          | Tucson            |
| Spaulding, George Frederick..... | Phoenix           |

|                               |         |
|-------------------------------|---------|
| Wilky, Leslie Guy .....       | Phoenix |
| Wuerdeman, Walter Henry ..... | Tucson  |

## FRESHMEN—27.

|                                 |                      |
|---------------------------------|----------------------|
| Aldrich, Howard C. ....         | Allentown, Pa.       |
| Bradstreet, Herbert Neal .....  | Bisbee               |
| Brown, Marguerite Bernice ..... | Tucson               |
| Campbell, Otis Muscott .....    | San Bernardino, Cal. |
| Cook, John Carl .....           | Douglas              |
| Conda, Mamie Wilhelmina .....   | Tucson               |
| DeLuce, Dona Dea .....          | Dome                 |
| Estill, Howard Wilmot .....     | Tucson               |
| Falvey, Edwin Carnicle .....    | Bisbee               |
| Flannagan, James Joseph .....   | Los Angeles, Cal.    |
| Firth, Charles Abraham .....    | Aravaipa             |
| Irvine, Elroy S. J. ....        | Phoenix              |
| Jackson, Benjamin Surnon .....  | Bisbee               |
| Jones, Sidney Raymond .....     | Clifton              |
| LaTourrette, Lyman D. ....      | Phoenix              |
| Lovejoy, Arthur Luccock .....   | Tucson               |
| McDole, Ruth Sophie .....       | Tucson               |
| Merriman, Ethel Roxanna .....   | San Jose, Cal.       |
| Merritt, Richard Louis .....    | Prescott             |
| Munds, William Harold .....     | Prescott             |
| Pearson, Sophie Shannon .....   | Wawaka, Texas        |
| Peterson, J. Earl .....         | Mesa                 |
| Schiek, Albert G. ....          | Los Angeles, Cal.    |
| Wetenkamp, Paul .....           | Bisbee               |
| White, Edwin Henry .....        | Dos Cabezos          |
| Whitwell, Sturges Bigelow ..... | Tucson               |
| Williamson, William Roy .....   | Los Angeles, Cal.    |

## UNCLASSIFIED COLLEGE—34.

|                                                               |                     |
|---------------------------------------------------------------|---------------------|
| Amstutz, Miss E.—Spanish, French .....                        | San Francisco, Cal. |
| Archibald, Charles—Civil Engineering, Mechanic Arts,<br>..... | Los Angeles, Cal.   |
| Batte, Homer Benjamin—Civil Engineering, Astronomy, Tucson    |                     |
| Bowen, Mary Shelton—English .....                             | Tucson              |
| Cadwell, Genevieve Frances—Spanish .....                      | Tucson              |
| Cameron, Alice Faith—English, Economics, Spanish .....        | Tucson              |

|                                                                          |                 |
|--------------------------------------------------------------------------|-----------------|
| Cameron, Jean Hunter—Spanish . . . . .                                   | Tucson          |
| Castaneda, Carlos—Chemistry, Botany . . . . .                            | Benson          |
| Felt, Lee Williamson—French, Latin . . . . .                             | Emporium, Pa.   |
| Garland, Eldon A.—Law, Business Practice . . . . .                       | Tucson          |
| Goodrich, Catherine Woolston—German . . . . .                            | Tucson          |
| Gossage, W. H.—Law . . . . .                                             | Tucson          |
| Guild, Marilla Merriman—English, Philosophy . . . . .                    | Tucson          |
| Haskell, Edward E.—Law, Business Practice . . . . .                      | Tucson          |
| Hofmann, Gladys Buellah—English . . . . .                                | Tucson          |
| Johnson, Erving A.—Mechanic Arts . . . . .                               | Morenci         |
| Kavanaugh, Rose Agnes—Zoology . . . . .                                  | Tucson          |
| McClure, John Clarendon—Mathematics, Physics,<br>Mechanic Arts . . . . . | Tucson          |
| Martin, Gladys Sarah—English . . . . .                                   | Tucson          |
| MacDougal, Louise Fisher—Philosophy, French . . . . .                    | Tucson          |
| Newcomb, Sue—Spanish, English . . . . .                                  | Brookfield, Mo. |
| O'Connell, Mildred Linza—English . . . . .                               | Tucson          |
| Olney, Beula Oakley—English, History . . . . .                           | Safford         |
| Parker, Sumner William—Agriculture . . . . .                             | Anderson, Ind.  |
| Perry, Laura Josephine—English, French . . . . .                         | Tucson          |
| Price, Helen Maude—Spanish . . . . .                                     | Tucson          |
| Rodee, Nona Martin—English, Spanish, Philosophy . . . . .                | Tucson          |
| Rodgers, Helen—Zoology . . . . .                                         | Canaille        |
| Rolfe, Clifton Howard—Mechanic Arts . . . . .                            | Swansea         |
| Roletti, Charles John—Mathematics . . . . .                              | Tucson          |
| Ross, Catherine Allen—German, Astronomy . . . . .                        | Tucson          |
| Thornber, Harriett Brown—Philosophy . . . . .                            | Tucson          |
| Trippel, Amy Irene—English, Astronomy . . . . .                          | Tucson          |
| Wright, Alice Littlefield—French, Spanish . . . . .                      | Tucson          |

## SHORT COURSE AGRICULTURE—9.

|                                  |                |
|----------------------------------|----------------|
| Aldrich, Howard C. . . . .       | Allentown, Pa. |
| Caywood, Arthur B. . . . .       | Clifton        |
| Hochderffer, George E. . . . .   | Flagstaff      |
| Jennison, Paul . . . . .         | Covina, Cal.   |
| Marshall, Thomas K. . . . .      | Tucson         |
| Olney, Daniel Clinton . . . . .  | Safford        |
| Parker, Sumner William . . . . . | Anderson, Ind. |
| Tierce, Homer Fleming . . . . .  | Cananea, Mex.  |

Wooddell, De Leslie.....Tucson

#### FOURTH PREPARATORY—18.

Barker, Anna Ruth.....Tucson  
 Batte, Homer Benjamin.....Tucson  
 Bird, Allen Tracy, Jr.....Nogales  
 Brown, Beryl.....Tucson  
 Cannon, Frank Mullen.....Congress Junction  
 Clark, Benjamin Harrison.....Benson  
 Culin, Frank Lewis, Jr.....Helvetia  
 Hofman, Gladys Buellah.....Tucson  
 Kavanaugh, Rose Agnes.....Tucson  
 Ketchum, William Russell.....Tucson  
 Lawson, Alice Patton.....Pearce  
 O'Connell, Mildred Linza.....Tucson  
 Rodgers, Helen.....Canaille  
 Rogers, Frederick William.....Tucson  
 Roletti, Charles Joseph.....Tucson  
 Rolfe, Clifton Howard.....Swansea  
 Salazar, Jose Urbano.....Chihuahua, Mex.  
 Talcott, Elizabeth.....Rockford, Ill.

#### THIRD PREPARATORY—28.

Barrow, Samuel George.....Tombstone  
 Beauchamp, David Carl.....El Paso, Texas  
 Bird, Walter Duane.....Nogales  
 Bogan, John Stewart.....Tucson  
 Campbell, William Riggs.....Tucson  
 Colton, Fannie Alberta.....Safford  
 Gaddis, Homer Baker.....Kingman  
 Gossard, Basil L.....Kempton, Ind.  
 Greenfield, Walter.....Little Rock, Ark.  
 Hayes, Virginia.....Cananea, Mex.  
 Hofmeister, Irene Louise.....Tucson  
 Holly, Mary Louise.....Tucson  
 Ijams, Clyde W.....Safford  
 James, Herbert Hanna.....Avalon, Pa.  
 Lindsley, Richard.....Tucson  
 MacDougal, Alice.....Tucson  
 Mack, Francis Cagwin.....Tucson

|                                |                   |
|--------------------------------|-------------------|
| McReynolds, William B.....     | Tucson            |
| Nichols, Louise Wichman.....   | Tucson            |
| Overlock, Lowell Winfield..... | Tucson            |
| Rea, Helen.....                | Tucson            |
| Richards, David LaMadrid.....  | Altar, Mexico.    |
| Scheerer, Cedric Ezra.....     | Twin Buttes       |
| Storrs, Marguerite Chloe.....  | Silver Bell       |
| Udall, Gladys Madge.....       | Tucson            |
| Wakefield, Edith.....          | Tucson            |
| Wuerdeman, Emil K.....         | Tucson            |
| Wyatt, Jane Dillon.....        | Los Angeles, Cal. |

## SECOND PREPARATORY—20.

|                                  |                   |
|----------------------------------|-------------------|
| Bennie, John Willis.....         | Clifton           |
| Brichta, Louis C.....            | Tucson            |
| Catron, Gertrude Leona.....      | Cananea, Mex.     |
| Cloud, Leo Frederic.....         | Tucson            |
| Davis, Minnie Carmen.....        | Tucson            |
| Foreshaw, Lea Theodore.....      | La Barranca, Mex. |
| Glennon, Joseph Henry.....       | Nacozari, Mex.    |
| Hummel, Florence.....            | Cortaro           |
| Isbell, Woodruff Charles.....    | Tucson            |
| Jarvis, Zola Bohall.....         | Tucson            |
| Kendall, Marcus Todhunter.....   | Ocean Park, Cal.  |
| Larsson, Axel.....               | Tucson            |
| McFarland, Robert Victor.....    | Tucson            |
| McConnell, Dee Charles.....      | Tacoma, Wash.     |
| Ming, Marcus Aurelius Smith..... | Fort Sill, Okla.  |
| Patton, Marion Lee.....          | Bisbee            |
| Pusch, Maybelle.....             | Tucson            |
| Powers, Helen R.....             | San Pedro, Cal.   |
| Simonds, Charles F.....          | Hermosillo, Mex.  |
| White, Arthur Laurimer.....      | Bisbee            |

## FIRST PREPARATORY—10.

|                             |                    |
|-----------------------------|--------------------|
| Cowell, Bryan Rooke.....    | Nacozari, Mex.     |
| Greenfield, Cora.....       | Little Rock, Ark.  |
| Hedges, Lawrence Seitz..... | Chattanooga, Tenn. |
| Lee, George.....            | Anderson, Ind.     |
| Nielsen, Eddie.....         | Globe              |

|                                 |                      |
|---------------------------------|----------------------|
| Norton, Marianna .....          | Mohawk               |
| Pound, William Roy .....        | San Pedro, Cal.      |
| Spalding, Charles Raymond ..... | Safford              |
| Stewart, Jeb .....              | Florence.            |
| Wilkerson, Edith Alma .....     | San Bernardino, Cal. |

## UNCLASSIFIED PREPARATORY—18.

|                                                               |                   |
|---------------------------------------------------------------|-------------------|
| Castaneda, Carlos—Latin .....                                 | Benson            |
| Christenson, Elmer W.—Chemistry, English, Mathematics, Tucson |                   |
| Corda, Mamie W.—Algebra .....                                 | Tucson            |
| De Luce, Dona Dea—Trigonometry .....                          | Dome              |
| Estill, Howard Wilmot—Physics .....                           | Tucson            |
| Firth, Charles Abraham—Mathematics .....                      | Aravaipa          |
| Felt, Lee Williamson—Latin .....                              | Emporium, Pa.     |
| Glenn, John Brookes—Algebra .....                             | S. Boston, Va.    |
| Irvine, Elroy S. J.—Chemistry, Trigonometry .....             | Phoenix           |
| Johnson, Erving A.—Mathematics .....                          | Morenci           |
| La Tourrette, Lyman D—Chemistry, Trigonometry .....           | Phoenix           |
| McClure, John Clarendon—Chemistry .....                       | Tucson            |
| McDole, Maynard Matthew—Chemistry .....                       | Tucson            |
| Martin, Gladys Sarah—History .....                            | Tucson            |
| McKay, Hazel—Stenography, Bookkeeping .....                   | Tucson            |
| Murphey, Walter—Geometry .....                                | Tucson            |
| Schiek, Albert G.—Chemistry, Trigonometry ..                  | Los Angeles, Cal. |
| Wetenkamp, Paul—Chemistry .....                               | Warren            |

## SUMMARY.

|                                  |       |
|----------------------------------|-------|
| Graduate Students.....           | 13    |
| Seniors.....                     | 11    |
| Juniors.....                     | 12    |
| Sophomores.....                  | 22    |
| Freshmen.....                    | 27    |
| Unclassified, College.....       | 34    |
|                                  | <hr/> |
| Total College.....               | 119   |
| Short Course in Agriculture..... | 9     |
| Fourth Preparatory.....          | 18    |
| Third Preparatory.....           | 28    |
| Second Preparatory.....          | 20    |
| First Preparatory.....           | 10    |
| Unclassified, Preparatory.....   | 18    |
|                                  | <hr/> |
| Total Preparatory.....           | 94    |
|                                  | <hr/> |
|                                  | 222   |
| Deduct—Counted twice.....        | 20    |
|                                  | <hr/> |
| Total for the University.....    | 200   |



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The Annual Report of the President of the University to the Board of Regents.

The Annual Register of the University.

The Announcements of the School of Mines, the Geological Survey, and the Several Departments of Instruction and Research.



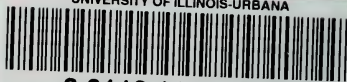








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